EFFECTS OF MISSING INFORMATION ON PRODUCT EVALUATIONS

By

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To my parents, Lib and Grant

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EFFECTS OF MISSING INFORMATION ON PRODUCT EVALUATIONS

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Most previous research examining product evaluations has implicitly assumed that the consumer has available information about all relevant product attributes. The current research examines how product evaluations are formed when some attribute information is not available. It was hypothesized that inferences are made about missing attributes and integrated with known information to form an overall evaluation. Inferred values were predicted to depend on expected correlations between known attributes and the inferred attribute.

In a series of four related studies, identical one-attribute test descriptions of refrigerators and carpet cleaners were evaluated in one of two information contexts. In one-attribute contexts, all alternatives were described in terms of only one attribute, the attribute contained in the test descriptions. In two-attribute contexts, most alternatives were described in terms of two attributes: the attribute contained in the test descriptions, and one other attribute. Attributes were paired in two-attribute contexts so that the expected correlation between the attributes was zero, highly positive, or highly negative.

Interest focused on evaluations of the test descriptions. In one-attribute contexts, it was expected that inferences would rarely be made about missing attributes. In two-attribute contexts, it was expected that such inferences would frequently be made.

Contrary to prediction, inferences were rarely made about missing attributes in the two-attribute context, and when they were made, they were rarely based on expected correlations between attributes. Other important effects of missing information were fairly robust across the the four studies and across a variety of dependent measures. Thinking about the missing attribute in the two-attribute context often resulted in lower evaluations and in decreased attention to the product information which was available. This decreased attention was manifested in a lower impact of known information on product evaluations. Protocols and a cognitive effort measure suggested that thinking about a missing attribute both diverted attention away from the known attribute and actually inhibited inferences which otherwise would have been made.

It was suggested that this process may have adverse effects on retention of product information. Implications for decisions about the provision of product information were discussed.

CHAPTER I
INTRODUCTION

There is a large body of literature devoted to the issue of how information about product attributes influences product-relevant cognitive activity. This literature encompasses multiattribute models of product evaluation (Green & Srinivasan, 1978; Wilkie & Pessemier, 1973), models of consumer choice processes (Bettman & Park, 1980; Einhorn, 1970, 1971; Lussier & Olshavsky, 1979; Wright, 1975), information load research (Jacoby, Speller, & Kohn-Berning, 1974; Scammon, 1977; Wilkie, 1974), and research which examines how the format of presented information influences information acquisition strategies (Bettman & Kakkar, 1977; Jacoby, Szybillo, & Busata-Schach, 1977).

Most of this research implicitly assumes that the consumer has accessible a complete set of relevant brand-attribute information. For example, as typically implemented, the multiattribute models assume that the consumer has knowledge about all attributes which influence evaluations. In decompositional approaches such as conjoint analysis (Green & Srinivasan, 1978), information is provided about a set of attributes, and the product evaluation based on this information is decomposed into part-worths associated with each attribute described. In compositional approaches such as the expectancy-value models (Wilkie & Pessemier, 1973), elicited evaluations of a set of described attributes are combined in accordance with the model to predict overall evaluations. In both of these approaches, attributes for which information is not explicitly provided are assumed not to differentially influence evaluations.

It should be noted that this assumption is not made when the compositional approach is used to examine evaluations of known brands. No attribute information is provided; instead, salient beliefs about the product are elicited and combined to predict overall evaluations. Particularly when the set of salient beliefs is determined at the individual level, this approach is likely to capture the consumer's cognitive structure for the brand. This approach does not, however, capture the relationship between product information and cognitive processing and structure.

The assumption that undescribed attributes have no effect on processing strategies and evaluations may be essentially correct in a laboratory environment in which all important attributes are described for each alternative, but this restriction creates a potentially serious misrepresentation of the consumer's information processing environment. It is probably the norm, rather than the exception, that consumers' information about products is in some way incomplete. For example, when a consumer's choice set includes alternatives that are carried by different retail outlets, memory or prior decisions about what information to record becomes the primary determinant of what information is available about the absent product.

In many situations, the availability of attribute information varies across alternatives. Marketers emphasize attributes for which the product has a competitive advantage, while de-emphasizing or withholding information about attributes for which the product is at a disadvantage. The assumption underlying this strategy is that by providing only positive information, a positive evaluation is insured. It is possible, however, that the absence of information fosters adaptive processing strategies. Consumers may make inferences about the missing attributes; such inferences may tend to be negative because of consumers' concerns about the manipulative intent of marketing communications or because of the risk involved in evaluating a product too positively. Alternatively, consumers may implement choice strategies which do not require the missing information. One such simple strategy would be to eliminate from consideration all incompletely described alternatives. Inference making and the modification of choice strategies may often be less effortful than information seeking. Because they may be implemented quickly and operate on information that is readily available, they may be common responses to incomplete information.

Because incomplete product information is pervasive, and because it is likely that incomplete information fosters processing strategies that are different from those that are implemented when complete information is available, it is important that we examine consumers' responses to incomplete information. Absence of desired product information may influence product evaluation, choice, and the manner in which consumers assimilate available product information.

Relatively little is known about how consumers respond to incomplete information. Most previous research has examined the relationship between available information and information processing strategies. Notable exceptions are a few studies examining how the accessibility in memory of previously acquired information influences choice (Biehal & Chakravarti, 1983, 1986; Dick, 1985) and how inferences about missing information influence product evaluations (Cohen, Miniard, & Dickson, 1980; Huber & McCann, 1982; Meyer, 1981; Yamagishi & Hill, 1981).

This research addresses several issues relevant to understanding how consumers respond to missing information. Theoretically, making an inference about the missing attribute is a likely response to missing information. This possibility is examined in some detail. A number of factors hypothesized to affect such inferences are examined. Alternative responses, such as simply lowering evaluations of incompletely described alternatives or giving less weight to known information, are also considered. Of particular interest are the attentional processes involved in thinking about and dealing with missing information. Implications of this research for decisions about the provision of product information are then discussed.

CHAPTER II
INFERENCES ABOUT MISSING ATTRIBUTES: A LITERATURE REVIEW

Many theorists have considered inference making to be an important cognitive activity. Inference processes are central in much of contemporary social psychological theory, including impression formation (Anderson, 1968, 1971), attribution (Bem, 1972; Jones & Davis, 1965; Kelley, 1967), and attitude formation and change (Fishbein & Ajzen, 1975; McGuire, 1968). In its most general sense, inference making refers to the process of deriving meaning from information, most often, making some judgment about the information. For example, Wyer and Carlston (1979) have defined inference as "the assignment of an object to a verbal or nonverbal concept or category" (p. 6). Inference often involves a categorization which goes beyond directly observable events, although this distinction is somewhat arbitrary (Fishbein & Ajzen, 1975). Many characteristics of entities which seem to be directly observable are not; they are simply well learned inferences from directly observable stimulus configurations. The concepts of _round_, _dark_, and _high quality_ are all examples of such inferences.

In the current context, inference will be given a more specific meaning, but one that is compatible with its more general sense. Inference will refer to a judgment, with evaluative implications, about a product attribute for which no information is directly available, either externally or in memory. In the more general sense of the term, all psychological evaluations of observed attribute information are inferences; in the current context, only those evaluative judgments which do not derive from objective descriptions of the attribute will be considered to be inferences.

The literature makes four different suggestions about the nature of inferences about missing information: (1) that such inferences tend to be evaluatively neutral, (2) that such inferences tend to be evaluatively negative, (3) that such inferences are based on expected correlations between known and missing attributes, and (4) that such inferences rarely occur. Each of these possibilities will be considered in turn.

Neutral Inferences

Some researchers have presented evidence that is consistent with evaluatively neutral inferences about missing attributes. Slovic and MacPhillamy (1974) were interested in judgment heuristics for reducing cognitive strain, specifically, with how structural characteristics of the judgment task influence the weights given to attributes. Their task was a comparative judgment of hypothetical students' expected performance in college based on scores reflecting English skills, need for achievement, and quantitative aptitude. For each judgment, subjects received two scores for each student. Sets were constructed so that there was information on one common dimension and one unique dimension for each member of a pair. It was expected that the ease with which comparisons could be made on the common dimension would result in greater use of a dimension when it was common than when it was unique. This effect was obtained, as indicated by greater regression weights for the common dimensions.

Although they did not test this hypothesis, Slovic and MacPhillamy presented Castellan's suggestion that subjects may have inferred average values for the missing information. This would result in smaller differences, on the average, between inferred and observed scores on the unique dimensions than between observed scores on the common dimensions. If this were true, the greater regression weights associated with the common dimension may be a statistical artifact. It is also possible that larger differences encouraged greater reliance on the common dimension. Introspections of some subjects suggested that this occurred. This explanation is consistent with evidence that dimensions on which stimuli have small differences tend to be discounted (Tversky, 1969).

The data are also consistent with Tversky's (1977) diagnosticity principle. One determinant of the salience of an attribute is its diagnosticity, or classificatory significance. People often sort information into clusters to reduce cognitive load and facilitate further processing. These clusters typically maximize within cluster similarity and between cluster dissimilarity of information. Attributes which are high in diagnosticity, that is, which may more readily be used to form such clusters, tend to be more salient or important in information processing.

The diagnosticity of attributes is extremely sensitive to the set of information being considered. In a comparative judgment involving Student A, with a high English skills score and a low quantitative score, and Student B, with a low English skills score and a high need for achievement score, the English skills score is more diagnostic because the two students may be classified along this dimension whereas they cannot readily be classified along the quantitative aptitude or need for achievement dimensions. On the other hand, if Student A is compared with Student C, who has a low need for achievement score and a high quantitative score, quantitative aptitude becomes more diagnostic. Only when scores on the common dimension are very similar will its diagnosticity tend to be low. The diagnosticity principle could account for the apparently greater reliance on common dimensions in these judgments. Even if subjects were making average inferences about the missing attribute, the normally greater differences on the common dimensions would make them more diagnostic.

Yamagishi and Hill (1983) also found some evidence for neutral inferences among a subset of their subjects. They were among the first to make inferences an explicit component of a judgment model. They hypothesized that inferences about missing attributes underlie the set size effect. The set size effect refers to the finding that overall evaluation becomes more extreme as the number of cues increases, even when the mean value of the set of cues remains constant. The increasing extremity of evaluation with increases in set size generally occurs at a decreasing rate. An averaging model of overall evaluations readily handles this deceleration; each additional cue effectively receives successively smaller weights because it is averaged in with a larger number of cues. For an averaging model to predict the increasing extremity of evaluations with no change in the mean value of cues, however, it is necessary to postulate input to the judgment other than the presented cues. This postulated additional input has generally taken the form of a neutral initial impression parameter which is averaged with presented information to arrive at a judgment. Yamagishi and Hill suggested that this initial impression parameter captures inferences which are made about all missing attributes considered to be important to the evaluation.

This explanation relies on the assumption that inferences tend to be evaluatively neutral. If this is true, then the provision of non-neutral information about a previously inferred attribute will tend to increase the overall extremity of the evaluation. Yamagishi and Hill reasoned that this will only occur when the originally presented information does not include all attributes important to the judgment. When all important cues are presented, no inferences will occur. Additional information will not replace neutral inferences, and no set size effect will occur.

To test this hypothesis, subjects were asked to make judgments about the qualifications of hypothetical applicants for various secretarial positions. The number of important attributes was manipulated by specifying that each position required one, two, or three of the following skills: typing, bookkeeping, and coordinating activities. The number of presented attributes was manipulated by presenting skill level scores for one to three of the required skills. It was hypothesized that increases in the number of skill level scores presented would result in more extreme evaluations only when the additional score was considered to be important.

For half of the subjects, this is exactly what occurred. For the remaining half of the subjects, however, additional skill level information always resulted in more favorable evaluations. This occurred whether or not the presented information was above or below the scale midpoint.

Analysis of responses to filler items indicated that the first group of subjects tended to rate candidates for whom they were given no skill level information close to the scale midpoint. The second group of subjects tended to rate candidates for whom no skill level information was available below the scale midpoint. Taken together, these findings suggest that the first group of subjects tended to make neutral inferences as predicted, while the second group of subjects tended to make negative inferences. If negative inferences were made, then the provision of additional information, even if it were somewhat negative, would tend to make evaluations more favorable.

It is also possible that subjects did not make explicit inferences about the missing attribute, but rather always averaged into their overall evaluations their general predispositions to view others positively or negatively. Kaplan (1971) found that subjects varied in their predispositions to view unknown others either positively or negatively, and tended to discount information inconsistent with their predispositions. In effect, predispositions seemed to act as a separate piece of information in evaluative judgments.

Negative Inferences

Several pieces of evidence suggest that inferences about missing information tend to be negative. Half of Yamagishi and Hill's (1983) subjects made evaluations consistent with negative inferences. Yates, Jagacinski, and Faber (1978) have also collected data that are consistent with inferences that are somewhat negative. Subjects were asked to evaluate profiles of hypothetical courses which were described in terms of interest, level of instruction, grade leniency, and work load. For some of the alternatives, information on level of instruction was omitted. Omission of level of instruction lowered evaluations relative to fully described alternatives with average or high levels of instruction, but raised evaluations relative to alternatives with a low level of instruction. These results are consistent with those that would be obtained if subjects inferred a level of instruction that was below average but not as low as that of alternatives which were described as low on that dimension.

Meyer (1981) has developed a model which describes how consumers evaluate product attributes under conditions of limited information, a special case of which is when there is no information about an attribute. His model predicts negative inferences about missing attributes. He hypothesized that the evaluation of a product attribute is determined by the amount of information available about that attribute for a given alternative, the amount of variability associated with that attribute for that alternative, and the mean and variance of that attribute across other alternatives. When information about an attribute is available, its subjective value depends primarily on an average value implied by the information and its variability. When no information is available about an attribute, its subjective value depends primarily on the expected mean and variance of that attribute for the given product class.

Formally, the model states that the evaluation of an alternative is a function of the subjective values of the attributes associated with that alternative.

$$O_i = f(K_1\ U_1(Z_{i1}),\ K_2\ U_2(Z_{i2}),\ \ldots,\ K_n\ U_n(Z_{in}))$$

where

O_i = overall evaluation of alternative i

$U_i(Z_{ij})$ = subjective value of attribute j of alternative i

K_j = scaling constant which reflects the relative importance of attribute j in the given decision making context

$f(\cdot)$ = any multilinear function

It is hypothesized that the subjective value of an attribute is a function of the average value of the attribute and the perceived variability associated with that attribute. Formally,

$$U_j(Z_{ij}) = K_1\ U_A(A_{ij}) + K_2\ U_D(D_{ij}) + K_3\ U_A(A_{ij})U_D(D_{ij})$$

where

$U_j(Z_{ij})$ = subjective value of attribute j of alternative i

$U_A(A_{ij})$ = subjective value of average value of attribute j of alternative i

$U_D(D_{ij})$ = subjective value of the perceived variability of attribute j of alternative i

K_1, K_2, K_3 = scaling constants

It is further proposed that increases in the average value, A_{ij}, are associated with increases in attribute utility, while increases in perceived variability, D_{ij}, are associated with decreases in attribute utility.

The average value A_{ij} is defined as

$$A_{ij} = W_1X_{ij} + (1 - W_1)\ AL_j$$

where

$0 \leq W_1 \leq 1$

X_{ij} = value of attribute j of alternative i

AL_j = adaptation level on attribute j

W_1 = empirically determined information weight which is hypothesized to increase with increasing familiarity with attribute j of alternative i.

The adaptation level is assumed to be the individual's expectation about the value of a typical alternative on attribute j. When there is no information about attribute j, the inferred value will be determined primarily by the adaptation level; the influence of the adaptation level will decrease with increases in information about the attribute for the alternative.

The perceived variability is defined in a similar manner:

$$D_{ij} = W_2V_{ij} + (1-W_2)T_j$$

where

$0 \leq W_2 \leq 1$

V_{ij} = perceived variability directly associated with attribute j of alternative i

T_j = perceived total variability in attribute j within and across alternatives

W_2 = empirically determined information weight hypothesized to increase with increases in familiarity with attribute j of alternative i

Perceived variability is posited to increase uncertainty about an attribute. The level of uncertainty associated with an attribute for which there is no information will always be greater than the uncertainty associated with an attribute for which there is some information available. Since uncertainty is associated with decreases in utility, inferences about missing information are expected to take on a discounted average value, that is, a value somewhat less favorable than the average value.

Meyer tested some of the assumptions and implications of this model using the functional measurement paradigm. Subjects were asked to evaluate hypothetical pizza restaurants which were described in terms of pizza quality, decor and music, and price, attributes previously determined to be perceived as most influential in determining preferences. Each attribute had three levels: above average, below average, and no information. Attribute levels were combined factorially to yield 27 descriptions. It was expected that patterns in evaluations would be consistent with those that would occur if attributes for which no information was given were inferred to have a somewhat negative value. This hypothesis was generally supported. The scale values of no information for quality and decor were significantly below neutral. Although the scale value of no price information was below neutral, this difference was not significant. As price information typically had a smaller impact on evaluations than did the other attributes, it is possible that the negativity of inferences is a function of the importance of the missing attribute. For less important attributes, inferences may be evaluatively neutral.

A third experiment was conducted to examine the relationship between perceived variability and inferences. Hypothetical pizza restaurants were described for a number of cities and subjects were asked to indicate the proportion of times they would visit each restaurant in a city. Variables manipulated included the number of ratings available for a given restaurant, the mean and variance of these ratings, the number of restaurants in each city, the number of ratings available for each of the other restaurants in a city, and the mean and variance of these ratings. As expected, increases in variability in information about quality for a given restaurant were associated with decreases in utility for that restaurant. Variablility on an attribute appeared to combine multiplicatively with the average or riskless value to influence judgments. Increases in variability across the restaurants, however, was only marginally associated with decreases in utility for restaurants for which little information was available, so it remains unclear whether perceived variability is responsible for negative evaluations of attributes for which there is no information available. Other factors, such as the importance of the missing attribute as suggested above, may instead determine the negativity of inferences.

Meyer suggests that inferences tend to be negative due to uncertainty caused by a lack of information. While his operationalization of uncertainty in this study is perceived variability, he also discusses uncertainty associated with the perceived reliability of information as affected, for example, by source credibility. He has indicated that the model may be expanded to incorporate inferences which are based on information about other product attributes. Although the effects were small, he obtained some evidence in these studies that price inferences may be based on information about other product attributes.

Biehal and Chakravarti (1983) have also presented data which are consistent with negative inferences about missing attributes. They were concerned with how consumers respond when they encounter new information which must be integrated with previously acquired information to form a product evaluation. They found that subjects who had poor recall for previously acquired information (acquired during a choice task) were significantly less likely to choose a brand to which they were previously exposed than were subjects who had good recall for previously acquired information (acquired during a directed learning task). Their data suggest that brands for which information is not available or accessible will be less likely to be chosen than brands for which information is externally available. Although there are other possible explanations, negative inferences about the missing attribute could cause this effect. In a study which examined similar issues, Dick (1985) found a similar pattern of data, but only for subjects who were not explicitly asked to make inferences. Subjects who were asked to make inferences instead appeared to make inferences consistent with what was already known about the product. These results are discussed below.

Inferences Based on Attribute Correlations

The evidence discussed so far suggests that inferences about missing attributes are uniformly evaluatively neutral or negative, and not directly influenced by information about other product attributes.

Some evidence, however, suggests that inferences are based on expected correlations between known and missing attributes. Most of this evidence involves the relationship between price and quality and the expectation that their evaluative implications are negatively correlated; that is, the lower and therefore more attractive the price, the lower and therefore less attractive the quality, and vice versa.

Yamagishi and Hill (1981) developed the following model of evaluations based on incomplete information:

$$Y_1 = b_1X_1 + b_2\hat{X}_2$$

where

X_1 = value of the presented information (first dimension)

$\hat{X}_2$ = inferred value of the missing information (second dimension)

b_1, b_2 = weights given to the first and second dimensions, respectively

The inferred value of X_2, $\hat{X}_2$, is given by

$$\hat{X}_2 = b_{21}X_1$$

where

b_{21} = slope of the expected linear relationship between X_1 and X_2.

All values for attributes are represented as deviation scores; thus there is no intercept term in the linear regression.

The b_{21} term allows the model to handle both cases in which the expected correlation between the evaluative implications of known and missing information is negative, and cases in which it is positive. While the model predicts inferences that are based on expected correlations between known and missing information, it does not predict inferences which are not dependent upon attribute correlations, such as the discounted average values observed by Meyer.

Subjects were asked to evaluate a relatively expensive durable good based on information about price alone, quality alone, or both price and quality. According to the model, when judgments are based on price or quality alone, these attributes should have a lower marginal value than when judgments are based on information about both price and quality. This is because the expected negative relationship between price and quality results in positive inferences when the known attribute is negative and negative inferences when the known attribute is positive. The overall effect of varying price or quality is therefore effectively lessened when the attribute is presented alone.

The predicted effect was observed for evaluations based on price information alone, but not for evaluations based on quality information alone. It was suggested that quality's relative importance to the decision was so great as to dominate the effects of price inferences; however, if this were true, then it would be expected that quality's relative importance would also dominate the effect of price when both attributes were known, and this did not occur. It seems more likely either that subjects failed to make price inferences or failed to weight such inferences very heavily in the evaluation.

There are at least two plausible explanations for a failure to make price inferences. It is possible that while subjects considered price to be a good indicator of quality and thus were willing to infer quality from price, they were less certain that quality is a good indicator of price. This asymmetry may be characteristic of price-quality expectations. Although Yamagishi and Hill prompted inferences from price to quality and quality to price in independent samples and found that price and quality inferences were symmetrical, this measure may not be a good indicant of naturally occurring inference processes.

A second explanation for the apparent failure to make price inferences rests on the relative importance of the two attributes. Perhaps the relative importance of the quality dimension led subjects to infer its value when it was missing, whereas price was not important enough to prompt inferences.

It is also possible that price inferences were made, but were dominated by evaluations of known quality because respondents were much more certain that the quality information was valid and reliable than they were that their price inferences were accurate. The number of possible explanations of these findings indicates a need to collect data which can reveal the nature of the underlying processes.

Huber and McCann (1982) proposed a model of inference processes in judgment which is formally almost identical to the Yamagishi and Hill (1981) model. They also assume that inferences depend upon the expected correlation between known and missing information, and that such inferences are integrated with known information. Their representation of this model makes its predictions about the marginal value or slope of the preference function explicit. The general preference function and its partial derivatives are defined in the following manner:

$W(X_1,X_2)$ = value of item given the value of X_1 on attribute 1 and X_2 on attribute 2

$\partial W/\partial X_1$ = marginal value of attribute 1 if information is provided on attribute 1 and attribute 2

$V(X_1)$ = value of item if information is provided on attribute 1 but not on attribute 2

dV/dX_1 = marginal value of attribute 1 if information is provided on attribute 1 but not on attribute 2

If $W = f(X_1,X_2)$ and no information is available on X_2, X_2 is replaced by its expected value, $E(X_2|X_1)$ so that $V = f(X_1,E(X_2|X_1))$. By taking partials and manipulating, this expression becomes

$dV/dX_1 = \partial W/\partial X_1 + \partial W/\partial X_2 \quad dX_2/dX_1$, or

marginal value of X_1 alone = marginal worth of X_1 given X_2 + marginal worth of X_2 alone x marginal change in X_2 given X_1. Thus, when there is a positive correlation between the evaluative implications of known and missing information, the marginal value of an attribute increases when it is presented alone. When there is a negative correlation, the marginal value of an attribute decreases when it is presented alone.

Subjects were asked to rate their likelihood of purchasing beers described in terms of price alone, taste quality alone, or both price and taste quality. It was expected that a negative expected correlation between the evaluative implications of these two attributes would result in a decrease in the marginal value of each attribute when it was presented alone. Some of the subjects simply made the required judgments; others were asked to make an inference about the missing price or quality before making their judgments. As expected, these explicit inferences indicated an expected negative correlation between the evaluative implications of price and quality.

As predicted, omission of price information reduced the marginal value of quality. In addition, mean purchase likelihood was significantly lower when price was missing and inferences were not prompted than when inferences were prompted or when both price and quality were known.

The effects of omitting quality information were different. Omitting quality significantly decreased mean purchase likelihood, and the decrease was significantly greater when price inferences were not prompted. Simply omitting quality information did not result in a significant change in the average marginal value of price, although it did result in a significant change in curvature. The marginal value of price increased at lower prices and decreased at higher prices so that purchase likelihood was greatest at medium prices. It was suggested that this effect may reflect a general tendency to avoid positive inferences, in this case, to avoid the inference of high quality from a high price.

When quality inferences were prompted, the marginal value of price went from negative to positive. This effect is predictable from the model due to the much greater marginal value of quality over price. (Quality had a greater impact on evaluations than did price. This may be because it was considered to be a more important attribute.) It was suggested that prompting quality inferences may have discouraged any tendency to avoid positive inferences.

It should be noted that the results in the conditions in which inferences were not prompted were very similar to those of Yamagishi and Hill (1985). When quality was omitted, the change in the marginal value of price was apparently greater than the corresponding change in the marginal value of quality when price was omitted. In both of these studies, quality received a greater weight in overall evaluations than did price. As suggested previously, the negative effects of missing information may increase with the importance of the missing attribute.

In general, the findings of this study suggest that omitting information decreases mean purchase likelihood, as if subjects are making negatively biased inferences about missing attributes. The strength of this effect may depend upon the importance of the missing attribute. Encouraging explicit inferences seems to weaken the effect. This may be because negatively biased inferences are made about a variety of product attributes when no inferences are prompted. Prompting inferences may deflect attention from these other product dimensions, eliminating much of the negative effect of missing information. It is also possible that prompting inferences encourages greater weighting of inferences in the evaluation, in effect, increasing the certainty that inferences are valid cues. Again, there is clearly a need to collect data which can give insight into the nature of the underlying cognitive processes.

One study has found evidence of inferences based on attribute correlations involving attributes other than price and quality. Dick (1985) found evidence that subjects inferred a camera's lens sharpness from an observed positive correlation between maximum shutter speed and lens sharpness. Such inferences were rare, however, unless subjects were specifically prompted to make inferences. When inferences were not prompted, choice patterns were consistent with what would have occurred if any inferences that were made were somewhat negative. As in the Huber and McCann study, the effect of missing information appeared to be negative unless subjects were specifically requested to make inferences.

It was suggested above that prompting inferences may deflect attention away from a variety of attributes previously inferred to be negative. The part-list cuing effect provides some support for this explanation. The part-list cuing effect is a reliable finding that the provision of some of a set of information to be recalled reduces ability to recall the remainder of the information (Roediger, 1974). Rundus (1973) has explained this effect by proposing that retrieval of information from memory is analagous to a process of sampling without replacement. The more information that has been recalled, the lower will be the probability that an attempt to recall new information will be successful. Rundus also proposes that attempts to recall new information are abandoned once a criterion number of successive recall attempts have been unsuccessful. If it is assumed that information provided at the time of retrieval acts in the same way as information previously recalled in a free recall situation, then this model predicts that such cues will reduce the likelihood that the remaining information will be successfully recalled.

Alba and Chattopadhyay (1985) found evidence that the part-list cuing effect may influence the availability of product attributes in memory. They demonstrated that providing attribute information at the time of retrieval inhibits recall of other attributes. Subjects were given a set of attribute information about automobiles which they were subsequently asked to recall. Subjects who were given some of the attribute information as cues were less able to recall other product attributes than were those who were not given such cues. Asking for inferences about a specfic attribute may have the same effect, making it less likely that other missing attributes will come to mind. If inferences do tend to be negatively biased, then inhibiting recall of missing attributes, and thus reducing the number of negative inferences that are made, should result in a more positive product evaluation.

Do Inferences Occur Spontaneously?

Slovic (1972) has proposed a principle of concreteness which suggests that inferences about missing information are rare: "a judge or decision maker tends to use only the information which is explicitly displayed in the stimulus object and will use it only in the form in which it is displayed" (p. 14). This is the implicit assumption underlying previous work in consumer information processing. Slovic cites a variety of research on judgment, problem solving, and decision making under risk which is consistent with the principle of concreteness.

While there is considerable evidence that people are capable of making inferences about unobserved attributes (Dover, 1982; Mazis & Atkinson, 1976; Olson, 1978; Olson & Dover, 1978a, 1978b; Yamagishi & Hill, 1981; see Fishbein & Ajzen, 1975, for a review of relevant literature on trait inference, cue utilization, and formal inference models), it is less clear whether such inferences occur spontaneously. Some evidence suggests that inferences are not made spontaneously, or at least that the nature of spontaneous inferences is different from inferences that are prompted. Both Huber and McCann (1982) and Dick (1985) found evidence that the tendency to make positive inferences was greater when inferences were prompted, while any unprompted inferences appeared more likely to be negative. Few empirical investigations of inference making have been designed to provide strong evidence that naturally occurring inferences mediate observed effects on judgments, however. It remains an empirical question whether inferences are a common response to missing information.

Some theorists have made suggestions about the conditions under which inferences may be expected to occur. Huber and McCann (1982) suggest that inferences are made only when ecological correlations between the known and missing attributes are strong, the missing attribute is relatively important, and the context encourages inference making. In their study, the contextual manipulation which encouraged inference making was an explicit request to make inferences, although they suggest that other situational factors can prompt inference making.

Hansen and Zinkham (1984) have elaborated on these suggestions. According to their theoretical framework, there are three major factors which influence the likelihood of making an attribute inference. First, the known and missing attributes must be strongly linked in memory. Although two attributes may be strongly linked for other reasons, this will most often occur when there is a high correlation between the two attributes.

Second, an attribute goal must have been formed and a high interrupt threshold maintained. This means that the consumer must have formed a goal with respect to the missing attribute and that this goal must be prominent in the goal hierarchy. Prominence in the goal hierarchy may be achieved in a number of ways. When environmental factors call attention to the missing attribute, as when most alternatives provide information about the attribute but some do not, or when the consumer imagines that there is high variability in the attribute across the product class, the attribute goal is likely to be prominent. When the attribute is relatively important to the consumer for any reason, the attribute goal is likely to be prominent.

Finally, the consumer must not be able to access what are perceived to be valid values of the attribute. If it is easy to obtain valid values of the attribute externally or from memory, no inference will be made. If it is not easy to obtain valid information, it is likely that an inference will be made.

According to this view, then, inferences are not made except under a special set of circumstances: there must be a strong association between the known and missing attribute, the consumer must desire that the product meet some predetermined goal with respect to the missing attribute, and it must not be possible to obtain the information in any other way.

Summary

Four suggestions about the nature of inferences about missing attributes have been examined: (1) that such inferences tend to be evaluatively neutral, (2) that such inferences tend to be evaluatively negative, (3) that such inferences are based on expected correlations between known and missing attributes, and (4) that such inferences rarely occur. In addition, some suggestions about when inference making is likely to occur have been examined. There has been little research which has directly examined these issues. In Chapter III, a conceptual framework is developed which proposes that inference making is a rational process of using the best information available to infer missing information. Sometimes this process leads to neutral inferences, sometimes to negative inferences, and sometimes to inferences which are based on correlations between known and missing attributes. It is proposed that inference making is not an automatic response to missing information, but that it is likely to occur when a consumer is attempting to evaluate a product and a missing attribute is made salient.

CHAPTER III

INFERENCES ABOUT MISSING ATTRIBUTES: A CONCEPTUAL FRAMEWORK

Although the studies reviewed in Chapter II provide a variety of suggestions about the nature of inferences, these differences may be reconciled in a conceptual framework which considers the informational bases of inferences as well as biases in responses to incomplete information. In understanding how inferences influence evaluations, it is also necessary to consider when inferences are likely to be made and how they will be integrated with known information to arrive at an overall evaluation.

Determinants of Inferred Values

The inference making literature reflects two ideas about the determinants of inferred values. The first is that inferences are based on some information or knowledge about the object of judgment. The second is that inferences are based on some dispositional or situationally induced tendency to make certain assumptions about missing information, particularly a tendency to assume that the missing attribute has negative evaluative implications.

Informational Bases of Inferences

Two kinds of product information have been suggested to be the basis of inferences about missing attributes: knowledge about other attributes, and knowledge about the average value of the attribute in the product class. It is generally assumed that inferences based on known attributes follow a rule of consistency; that is, the missing attribute is inferred to be in some way consistent with the known attribute. The concept of consistency as a criterion for cognitive processing has a rich history in psychological theory, beginning with Heider's principle of balance (1944, 1946, 1958), and including Osgood and Tannenbaum's congruity theory (1955) and Festinger's cognitive dissonance theory (1956), among others (see Abelson, Aronson, McGuire, Newcomb, Rosenberg, & Tannenbaum, 1968).

Known attributes and consistency processes. Two types of consistency processes have generally been posited: evaluative consistency and semantic consistency. Evaluative consistency refers to an inference process in which the inferred attribute is simply assumed to be similar in evaluative implications to known attributes; if what is known about the product is generally good, then what is not known about the product is assumed to be generally good. Evaluative consistency is the basis of the familiar halo effect observed in many evaluation situations. For example, if a consumer were to infer that a fuel-efficient car is sturdily built because fuel efficiency makes the car attractive, and an attractive car is assumed to have attractive features, this would be an evaluatively consistent inference.

In contrast, semantic consistency refers to an inference process which is based, not on the evaluative implications of known attributes, but rather on their logical relationship to the missing attribute. An inference that a luxurious car is high priced is a semantically consistent inference. It is the knowledge that luxury features are costly that leads to this inference. Semantic consistency is sometimes referred to as probabilistic consistency because the meaning that links two attributes semantically may not be inherent in the attributes themselves but may derive from ecological correlations between the attributes. It may be expected that a lime green car is likely to be a small economy car, not because the color and size are causally related, but because they are ecologically correlated.

There has been little systematic examination of the relative importance of semantic or evaluative consistency processes in inference making. Often evaluative and semantic consistency have similar implications, making it difficult to distinguish underlying inference processes. Fishbein and Ajzen's (1975) review of research on trait inferences, however, suggests that semantic consistency is preferred as long as there is a strong correlation between known and missing attributes; otherwise, evaluative consistency is used.

In a study which examined product choices, Dick (1985) also found evidence of a preference for semantically consistent inferences. Subjects were asked to evaluate cameras described in terms of flexibility, convenience, durability, and maximum shutter speed. Half of the subjects were also told to memorize the attribute information in preparation for a recall test. Subjects then saw descriptions of a second group of cameras which included information about an additional attribute, lens sharpness. There was a high positive correlation between shutter speed and lens sharpness in this product set. Finally, subjects were asked to infer the lens sharpness of each camera in the first group, and to choose one camera from all of the cameras in both groups combined. While performing this task, they were not allowed to refer back to the descriptions of the first group of cameras, although they retained access to the descriptions of the second group.

Dick predicted that subjects who had been instructed to learn the attributes of the cameras would make semantically consistent inferences based on shutter speeds, while the remaining subjects would instead make evaluatively consistent inferences based on their overall evaluations of the cameras. He reasoned that all subjects would prefer to make semantically consistent inferences, but only subjects who could remember the shutter speed information would be able to do so. Subjects who could not remember specific attribute information would be forced to rely on their overall evaluations to make inferences about lens sharpness. The data supported this prediction. These results suggest that the availability of information about correlated attributes may be an important determinant of the type of consistency process that is used. When such information is available, semantically consistent inferences may be made, while when it is not, evaluatively consistent inferences may be made.

The circumstances under which the inference is made may also determine whether semantic or evaluative consistency operates (Cohen, 1977). When an inference is made during the evaluation process, even if prompted, consumers may prefer semantic consistency, which is more likely to generate valid inferences. In contrast, when subjects are prompted to make inferences independent of the evaluation process, the validity of the inference may be less important, and evaluative consistency may be more likely to operate because of the ease with which it may be implemented.

Average attribute values. When inferences are based on knowledge about the average value of the attribute in the product class, it is generally assumed that the missing attribute is inferred to have an average or typical value regardless of the values of the known attributes. If it is assumed that average values tend to be evaluatively neutral, then evidence suggesting that inferences are evaluatively neutral are consistent with such a process. Evidence that inferences tend to be evaluatively negative may also be consistent with such a process, if it is assumed that average values tend to be evaluatively negative.

In his model of evaluations based on incomplete information, Meyer (1981) formally proposes that inferences are based on expected average values of the missing attribute in the product class, although he hypothesizes that inferences are somewhat more negative than perceived average values, with the degree of negativity being a function of the perceived variability of the attribute across the product class. In Meyer's conceptual framework, then, neutral inferences may occur when the perceived variability of the attribute across the product class is low, while negative inferences occur when the perceived variability is higher.

Dispositional or Situational Biases in Inferences

Kaplan (1971) has presented evidence that individuals have predispositions to make positive or negative inferences about unknown others. Yamagishi and Hill (1982) also found evidence of such a process. Such predispositions may represent naive theories about human nature. It is possible that individuals have similar biases in their evaluation of products.

Data which suggest that inferences tend to be negative or neutral are consistent with the operation of such predispositions or biases. Empirical evidence provides greater support for a negative bias. Not only are the data described in Chapter II under Negative Inferences consistent with such a process, but there is some evidence which suggests that unprompted semantically consistent inferences may be negatively biased (Huber & McCann, 1982).

There are a number of theoretical processes which could explain a negative bias in inferences. Meyer (1981) has proposed that uncertainty, as operationalized by perceived variability of the missing attribute, has a negative utility which combines in an additive fashion with the evaluation of the attribute under conditions of certainty. Ahtola (1978) has also presented evidence that variability is evaluated negatively and influences product evaluations independently of expected values associated with attributes.

While uncertainty per se may sometimes be evaluated negatively, it is clear that consumers sometimes seek uncertainty, as when they choose to purchase a new product over a familiar brand. It has often been suggested that uncertainty is made aversive by the associated risk of negative outcomes. Bauer (1960) first introduced the concept of perceived risk as an explanatory concept in consumer behavior. Cox's (1967) elaboration of Bauer's work proposed that perceived risk is a function of the strength of possible negative outcomes associated with a behavior and the consumer's subjective probability that they will occur. It was proposed that consumers act to reduce perceived risk through behaviors such as information seeking, brand loyalty, and pre-purchase deliberation. Inferring that a missing attribute is negative may be a risk-reducing strategy which makes it less likely that unacceptable products will be positively evaluated. If negative inferences act to reduce risk, then it would be expected that the strength of this effect could be manipulated by manipulating either the subjective probability or the strength of possible negative outcomes. For example, the effect would be expected to be stronger in purchase decisions than in decisions about what alternatives to include in one's consideration set, since both the probability and extremity of negative outcomes for the second decision would generally be lower.

Another explanation for a negative bias in inferences is attributional. Because of concern about the manipulative intent of marketing communications, consumers may develop causal schemata (Kelley, 1972) which lead to the inference that product information which is not readily available is negative. If such a process operates, then the strength of the effect should be influenced by variables which affect the likelihood that the causal schemata will be implemented. For example, the effect would be expected to be greater when the information source is the product label or package than when it is a more neutral source, such as Consumer Reports.

The Nature of Inferences

Based on the above discussion about informational bases and situational or dispositional biases in inferences, a conceptual framework which reconciles differing evidence about the nature of inferences will be developed. It has been suggested that not all inferences are made with the goal of generating valid information

(Cohen, 1977). Subjects are often asked to make inferences in empirical investigations of inference making. Under some circumstances, for example, when the product has already been evaluated and the inference will not be used in subsequent decision making, individuals may be less concerned about the validity of inferences. Under other circumstances, however, individuals may be genuinely interested in making a valid inference. This seems particularly likely to occur when the consumer is trying to evaluate a product for which some desired information is not available. This framework is concerned with describing how inferences are made under these circumstances.

Use of Best Predictor

It is proposed that when consumers make inferences in response to a desire to generate valid information, they follow a very rational process of using whatever information is regarded as the best predictor of the missing attribute. When there is a high perceived correlation between known and missing attributes, the known attribute is taken as the best predictor, and inferences are based on semantic consistency. If known attributes are not thought to be highly correlated with missing attributes, then the expected average value of the attribute in the product class is taken as the best predictor, and this average value is used in making the inference. Even when consumers have little knowledge of the product class, this strategy may be used if an assumption is made about the evaluative implications of the average value, for example, that it is neutral, or somewhat negative. Evaluative consistency is proposed not to be used to make inferences about desired product information.

These propositions are consistent with evidence about the nature of inferences. All of the studies previously cited as providing evidence of uniformly negative or neutral inferences employed attributes which are probably not considered to be highly correlated. In the Slovic and MacPhillamy (1974) study, the attributes employed were English skills, need for achievement, and quantitative aptitude. Yamagishi and Hill (1983) used typing skills, bookkeeping skills, and coordinating skills. Yates et al. (1978) examined the course attributes of interest, level of instruction, grade leniency, and work load. Meyer (1981) explicitly eliminated from consideration cases in which a strong relationship was expected between attributes, although he did find evidence of an interaction between price and restaurant decor, which could be interpreted as one aspect of quality. Price and quality, of course, are generally considered to be semantically related.

Studies which have found evidence of semantic consistency processes have typically used the attributes price and quality (Huber & McCann, 1982, Yamagishi & Hill, 1981), although Dick (1985) found evidence of semantically consistent inferences between camera shutter speed and lens sharpness among subjects who had observed product sets which exhibited a high positive correlation between these two attributes.

It might be expected that when there is no expected correlation between known and missing information, the evaluative implications of known information are taken as the best predictors of missing attributes, rather than the expected average value of the attribute in the product class. Dick's (1985) data seem to support this contention. He found that subjects who could not recall the value of the correlated shutter speed attribute made evaluatively consistent inferences about lens sharpness. These subjects, however, had previously formed an overall evaluation of the cameras and were explicitly asked to make inferences about lens sharpness. Although they presumably needed valid values of the lens sharpness attribute to make the best product choice, these subjects may have been discouraged from attempting to generate valid values because their memory for all of the attribute information was poor. They may have instead adopted a strategy of relying on their previous overall evaluations to make the decision.

Subjects who were not prompted to make inferences exhibited choice patterns which may be interpreted as consistent with negative inferences about missing attributes. While it is impossible to tell whether they were actually making inferences, the intent here is to describe how naturally occurring, rather than prompted, inferences are made. Given the evidence which suggests that any unprompted inferences which are made are often negative or neutral, it is proposed that evaluative consistency is not often used to make inferences in reponse to the need to fill in missing information.

Negative Bias

The assumption that inferences are based on the best information available does not account for evidence which suggests that inferences tend to be somewhat negative. It has been proposed that the tendency to make negative inferences increases with the perceived variability of the attribute across the product class (Meyer, 1981). Evidence which suggests that variability has a negative impact on evaluations may reflect the sensitivity of psychological evaluations to the distribution of observed values (Birnbaum, 1982; Parducci, 1965), however, rather than a tendency to make negative inferences when perceived variability is high.

It is here proposed that variability of the missing attribute has no direct effect on the inferred value, although it may affect the consumer's subjective probability that the inferred value is valid or correct. Instead, negativity of inferences is proposed to be a direct function of the perceived importance of the unknown attribute. The greater the perceived importance of the unknown attribute, the greater is the tendency to infer that it is negative. There is some weak support for this proposition in the studies reviewed above, in which subjects seemed to avoid making very positive inferences about quality, but not about the less important attribute, price (Huber & McCann, 1982, Meyer, 1981, Yamagishi & Hill, 1981).

This proposition is also consistent with the two theoretical explanations for negativity discussed above. Negativity may be interpreted as a risk-reducing response bias to avoid evaluating alternatives too positively. The more important the missing attribute, the greater is the strength of potential negative outcomes if the inference is too positive. It may be argued that evaluations which are not followed by a commitment such as a purchase involve no risk; however, it may also be argued that an habitual bias in inferences is likely to persist unless the reward structure is altered to strongly favor a different bias. The effect may not be as strong when there is no commitment, however.

The bias may also be interpreted as resulting from negative attributions about the reasons for the unavailability of the information. The more important the missing information, the greater is the expectation that the information should be provided. While the information provided in a research setting may not be subject to the same attributional biases as information provided by marketers, if subjects are encouraged to treat product information in a realistic fashion, the bias should be present.

It is not the intent of this research to determine which, if either, of these theoretical explanations is correct. Rather, the intent is to discover whether a negative bias in inferences does exist. While an appreciation of the possible antecendents of a negative bias can aid in the design of a research plan which will be likely to detect the effect, this consideration seems relatively unimportant, as evidence of a negative bias comes from studies which were not designed to manipulate the probability of a negative bias. If a negative bias is found, examination of its theoretical antecedents may be undertaken in subsequent research.

Inferences as Negatively Biased Best Predictions

To summarize, it is proposed that inferences are negatively biased best predictions. Information perceived to be the best predictor of the missing attribute is used to arrive at a tentative prediction of its value. If known attributes are thought to be highly correlated with the missing attribute, this correlation is used to make the prediction. Otherwise, the expected average value of the attribute in the product class, which is likely to be evaluatively neutral, is used to make the prediction. The tentative prediction is then adjusted in a negative direction as a function of the importance of the missing attribute. If the missing attribute is unimportant, this adjustment is minimal. If the missing attribute is important, this adjustment is large.

Inferred values, then, are posited to vary as a function of the perceived correlation between known and missing information and the importance of the missing attribute. If known attributes are not thought to be correlated with missing attributes, inferences are not influenced by the values of known attributes. The inference is neutral or negative, depending on whether the missing attribute is relatively unimportant or important.

If known attributes are thought to be correlated with the missing attribute, inferences are influenced by the values of known attributes. If a positive correlation is expected between the evaluative implications of known and missing information, inferences vary directly with the evaluative implications of known information. If a negative correlation is expected, inferences vary inversely with the evaluative implications of known information. The greater the importance of the missing information, the less positive are these inferences, however.

Effect of Inferences on Judgment

To understand the importance of inferences in product evaluation, it is necessary not only to understand how such inferences are made, but also to understand when they are likely to be made and what influence they subsequently have on evaluations. These topics are briefly discussed below.

Conditions Under Which Inferences Are Made

It is clear that consumers do not always think about attributes for which they have no information, much less go through the process of making inferences about them. Slovic (1972) has suggested that this is rarely the case. Hansen and Zinkham (1984), elaborating on Huber & McCann's (1981) suggestions, have hypothesized that inferences are only made when there is a strong association between known and missing attributes, the consumer desires that the product meet some predetermined goal with respect to the missing attribute, and it is not possible to obtain the information in any other way. These conditions were specified for inferences based on a correlation between known and missing information. It is proposed here that inferences may also occur when there is no perceived relationship between known and missing information.

The requirement that the consumer desire that the product meet some predetermined goal with respect to the missing attribute encompasses all factors that would act to make the missing attribute a salient consideration in the decision making process. It is here proposed that when a consumer is trying to evaluate a product, simply thinking about any reasonable attribute is sufficient to make it a salient consideration in the decision making process. If a missing attribute is thought about and demands on processing capacity are not so great as to prevent it (high information load, limited time, etc.), an inference is made about the missing attribute and integrated with known information to arrive at an overall evaluation. This proposition assumes that the consumer tries to consider all relevant attributes in arriving at an overall evaluation. It does not assume, however, that the consumer actively tries to think of all possible attributes. Rather, it appears likely that consumers are strongly influenced by the set of attributes that is readily available to them, as indicated by Slovic's (1978) principle of concreteness.

There are a number of factors which may make a missing attribute salient, however. Obviously, if the consumer is looking for certain attribute information, it will be salient. This may be particularly likely to happen for important missing attributes. A strong association between a known and a missing attribute may also make the missing attribute salient. When this is true, the processes of thinking about the missing attribute and making an inference may be almost simultaneous. Such a process seems likely to operate when consumers make inferences about quality based on price, for example.

The information context may also call attention to a missing attribute. It has been suggested that when most alternatives provide information about an attribute, but some do not, the missing attribute becomes salient for the less completely described alternatives (Hansen & Zinkham, 1984). Some evidence supports this proposition. Slovic and MacPhillamy (1974) found evidence of greater reliance on common rather than unique dimensions in a comparative judgment task. As discussed in Chapter II, these results would be expected if subjects were inferring average values for the missing information on the unique dimension. The researchers asked a second group of subjects to make judgments individually for all of the profiles in the original study and generated comparative judgments based on these ratings. The effect of increased weight on the common dimension was greatly lessened. It appears that the comparative judgment task calls attention to the missing information.

Yates et al. (1978) found a tendency for a greater weight to be given to a dimension when it was sometimes missing than when it was always present. This may represent increased attention to the occasionally missing information. Although this evidence is particularly weak, it is worth noting that Yamagishi and Hill (1981) did not find evidence for price inferences from quality information (although they did for quality inferences from price information) in their between subjects design, while Huber and McCann (1982) did find evidence for price inferences in their within subjects design. It appears that price inferences were not made unless respondents did have price information for some alternatives.

There is a variety of other factors which may operate to make missing attributes salient. This is not intended to be an exhaustive discussion. The major proposition is that when consumers are trying to evaluate a product, and they think about a missing attribute, they are extremely likely to make an inference about that attribute. Situational factors which call attention to missing attributes, therefore, may be important determinants of the inferences that are made. It was suggested that one important determinant is the information that is available for other alternatives. The information that is provided by competitors, for example, may determine which attributes are considered and inferred, if necessary, in evaluating a product.

Contribution to Evaluations

Inferences may be regarded as less valid indicators of a product's characteristics than are judgments based on direct information. Graesser, Robertson, and Anderson (1981) found that inferences are perceived to be less true than is information that has actually been presented. For this reason, consumers may be unwilling to rely heavily on inferences; uncertainty about inferred values may reduce the weight given to the inference in an overall evaluation. There is considerable evidence in the behavioral decision theory literature which suggests that uncertainty about cue values influences the weight which cues receive in judgment (Einhorn & Hogarth, 1981). It was suggested above that the perceived variability of the unknown attribute across the product class may be one variable which influences the subjective probability that the inference is a valid indicator.

While the data which support this general proposition are quite weak, some of the data discussed above are consistent with lower weights given to inferred values. Slovic and MacPhillamy (1974) found less weight given to dimensions for which information was missing. Yates et al. (1978) found a tendency for greater weight to be given to a dimension when information was sometimes missing; however, their estimates of weights are based only on evaluations for completely described alternatives, so it is not possible to tell if the weight given the dimension was smaller when it was missing. Because of the difficulty of separating weights and scale values in these studies, evidence which suggests that inferred values tend to be negative to neutral may often be interpreted as a reduction in weight given to the inferred value. It would be useful to estimate parameters including inferred values and weights so that it would be possible to separate these effects.

In summary, it is proposed that the impact of inferences on judgment is lower than the impact of attributes about which there is direct information. This effect is mediated by uncertainty about the validity of inferred values.

Hypotheses

A number of hypotheses about the inference making process have been advanced. These hypotheses are presented formally below:

H1: Under a product evaluation processing goal, the likelihood of making an inference about a missing attribute increases with the salience of the missing attribute.

H2: Inferred values are influenced by the expected correlation between known and missing attributes and the perceived importance of the missing attribute.

a. When the missing attribute is not expected to be highly correlated with the known attribute, the inferred value is a negatively biased expected average value for that attribute; that is, it tends to be somewhat less positive than the expected average value.

b. When the attribute is expected to be highly correlated with the known attribute, the inferred value is a negatively biased prediction from the known attribute; that is, it tends to be somewhat less positive than would be predicted from the correlation with the known attribute.

c. The size of the negative bias increases with the importance of the missing attribute.

H3: Inferred values have less influence on evaluation than if the same attribute values were known. This effect is mediated by uncertainty about the validity of the inferred values.

CHAPTER IV
RESEARCH OVERVIEW

Situation of Interest

The purpose of this research is to examine the effect of missing information on product evaluations. In particular, various factors which are hypothesized to influence inferences about missing attributes and the effects of such inferences on product evaluations are examined. Is inference making a common response to missing information? How are such inferences made, and what impact do they have on product evaluations? When inferences are not made, how does missing information affect cognitive activity and product evaluation?

Salience of Missing Attributes

Hypothesis 1 predicts that inference making is extremely sensitive to contextual cues which call attention to missing attributes. When a consumer is trying to evaluate a product, and an attribute for which information is not available is somehow made salient, it becomes likely that an inference will be made about the missing attribute. Otherwise, the inference is unlikely to be made. Therefore the outcome of an evaluation is influenced not only by available information, but also by contextual cues which make missing attributes salient.

Consider a simple example. Suppose a consumer is trying to evaluate a refrigerator based on a catalog description. Descriptions of various models contain a variety of information. For most models, there is information about capacity and the estimated energy cost to operate the refrigerator. For one of the models, however, the energy cost information is omitted. In this context, it is hypothesized that the consumer is likely to make an inference about the missing energy cost. The energy cost attribute has been made salient by its general availability in the choice context.

Now consider a situation in which there is information about capacity and warranty for most models. For one model, warranty information is not given. In this context, it is predicted that inferences will be made about the missing warranty.

Given the same product description, the energy cost inference and the warranty inference may differ in their evaluative implications. For example, a small refrigerator may be assumed to have relatively low energy costs, a positive attribute, while it may be assumed to have a limited warranty, a negative attribute.

This implies that a product may be evaluated differently depending upon the context in which information about the product is encountered. The information that competitors provide about their products may thus be an important determinant of the way products are evaluated. Omitting attribute information provided by competitors may induce consumers to make inferences about the missing attribute. Depending upon the nature of these inferences, this may have either a positive or negative impact on product evaluations.

Of course there are a variety of other factors which may increase the salience of a missing attribute, such as the consumer's preconceived evaluation rule or a marketer's deliberate attempt to encourage inferences (e.g., L'oreal's "It costs more, but I'm worth it"), but the information provided by competitors is a pervasive natural manipulation of attribute salience not controlled by the marketer. For this reason, it is particularly useful to discover how it affects the processing of product information.

Determinants of Inferences

Imagine that a consumer prefers a large refrigerator capacity, a long warranty, a large number of shelves, and a low energy cost, even though he or she may not have those goals in mind. Now imagine that the consumer only has information about capacity. It is likely that evaluations will be based solely on capacity. If another attribute becomes salient, however, inferences are likely to be made about that attribute and entered into the overall evaluation. Hypothesis 2 predicts that inferences are influenced by the perceived relationship between known and missing information and the perceived importance of the missing attribute. Three types of relationships between known and missing information may be considered.

First, there may be no perceived relationship between known and missing information. For example, it may not be expected that capacity and warranty are correlated. Therefore an inference about warranty is likely to be based on the expected average warranty in the product class. Inferences are negatively biased, however, so the warranty is inferred to be somewhat below average. If warranty is important to the consumer, it is inferred to be considerably below average; if it is unimportant, it is inferred to be close to average. The same inference is made regardless of the size of the refrigerator.

Second, there may be an expected positive correlation between the evaluative implications of known and missing information. If the consumer believes that larger refrigerators have more shelves, then the greater the capacity, the greater the shelf space is expected to be. Shelf space is inferred to be somewhat less than for refrigerators of similar size, however. If shelves are important, this difference is large; if shelves are not very important, this difference is relatively small.

Finally, there may be an expected negative correlation between the evaluative implications of known and missing information. If the consumer believes that larger refrigerators cost more to operate, then the greater the capacity, the higher (and therefore less attractive) the energy cost is expected to be. Energy cost is always inferred to be somewhat higher than for other refrigerators of similar size, however. The greater the importance of energy cost, the greater is this discrepancy.

Method Overview

These hypotheses were tested in a series of studies in which subjects were exposed to hypothetical catalog descriptions and asked to indicate their degree of liking for each alternative described. These product descriptions were provided in a context in which alternatives were always described in terms of one attribute (one-attribute context) or in a context in which alternatives were typically described in terms of two attributes (two-attribute context). In the evaluations of interest, information was provided about only one attribute. These descriptions appeared in both the one-attribute and the two-attribute contexts.

In the context in which all alternatives were described in terms of one attribute, it was expected that no inferences would be made about other product attributes. In the context in which information was normally provided about two attributes, it was expected that inferences would be made about the missing attribute.

The sets of attributes employed in two-attribute contexts were constructed so that the salient missing attribute varied in its perceived relationship with the known attribute (no correlation, positive correlation, and negative correlation). Thus the salience manipulation (one-attribute context or two-attribute context) allowed a test of Hypothesis 1, while the manipulation of perceived relationship between known and missing attributes allowed a partial test of Hypothesis 2. The effect of perceived importance (Hypothesis 2c) and the weight given to inferences in overall evaluations (Hypothesis 3) were not examined, for reasons which will be described below.

Dependent Measures

A number of dependent measures were examined for evidence of inference making. Most of the studies described in Chapter II rely on an examination of overall evaluations to determine if they reflect patterns consistent with the proposed inference making process. When direct evidence of inferences is available, it is from prompted inferences. In this research, prompted inferences are of less interest than naturally occurring inferences. Inferences were not prompted, except to facilitate selection of attribute pairs with the needed perceived correlations. While patterns in overall evaluations were examined for evidence of inference making, other measures were examined to provide converging evidence that the proposed inference making process was occurring. The major dependent measures were product evaluations, cognitive effort, and verbal protocols.

Product Evaluations

The information integration paradigm (Anderson, 1974, 1982) is perhaps the most powerful technique for analyzing the psychological process by which consumers combine attribute information to arrive at an overall evaluation. Lynch (1985) has contrasted this approach with other common approaches to multiattribute modeling in the consumer behavior literature, including numerical conjoint measurement (Green & Srinivasan, 1978), axiomatic conjoint measurement (Krantz & Tversky, 1971; Tversky, 1967), and compositional correlational approaches (e.g., Wright, 1974). Although there are many differences among these approaches, the primary strength of the information integration paradigm lies in its ability to separate the issue of the validity of the psychological model from issues of the measurement of the independent and dependent variables.

In the information integration paradigm, it is assumed that consumers' ratings of overall evaluations result from a three-stage process:

(1) a valuation stage, in which the consumer evaluates each attribute (a_i, b_j, and c_k), assigning scale values (s_i, s_j, and s_k) to each. No assumption is made about the relationship between objective attribute values and subjective scale values.

(2) an integration stage, in which the scale values are integrated as proposed by the model. This integration function, $I(s_i, s_j, s_k)$, yields an overall psychological impression of the product, V_{ijk}.

(3) an output stage, in which the integrated impression is transformed by a monotonic output function, $O(V_{ijk})$, into an overt response, r_{ijk}.

In order to examine the validity of the psychological model, to estimate scale values, or to examine the monotonic output function, it is necessary to address all three of these issues. This was the original approach taken in the current research.

A model of the psychological judgment process was developed. The model incorporates the hypotheses about how inferences are made, how they affect evaluations by taking into account the perceived relationship between known and missing attributes, the importance of the missing attribute, and the certainty associated with the scale value of each known and inferred attribute. A linear output function was assumed. An iterative parameter estimation procedure was planned to estimate scale values for inferences and to assess whether inferred values and their effect on evaluation are consistent with Hypotheses 1, 2, and 3. A good fit of this model would provide moderately strong support for these hypotheses, and overcome the problem of relying on patterns in overall evaluations, which could be influenced by a number of factors other than inferences.

When early experiments, described in Chapters VI and VII, indicated that inferences were not being made as hypothesized, the parameter estimation procedure was abandoned. For this reason, Hypotheses 2c and 3 were never tested. Instead, interest focused on determining how subjects were responding to incomplete information, as they did not appear to be making inferences. The model of the inference and information integration processes proved useful in indicating patterns in overall evaluations that would be expected if inferences were occurring and in determining needed sample sizes to detect predicted effects. It was instrumental to leading to the conclusion that inferences were not occuring as predicted. This model is described briefly below.

A model of the evaluation process. It was assumed that the integration function is best represented by an averaging model in which the scale values of the attributes are weighted according to their relative contribution to the overall evaluation. Averaging models generally have been more successful in accounting for observed patterns in overall evaluations than have adding or summation models (N. H. Anderson, 1965, 1967; N. H. Anderson & Shanteau, 1977; T. Anderson & Birnbaum, 1976; Birnbaum, 1973, 1974; Birnbaum & Stegner, 1979; Lynch & Cohen, 1978; Lynch, 1979). Although it has been argued that a summative model which incorporates inferences about missing information can account for the crossover interaction and decelerating set size effects which support an averaging model (Cohen, Miniard, & Dickson, 1980; Fishbein & Ajzen, 1975; Huber & McCann, 1982; Yamagishi & Hill, 1981), it has generally been overlooked that inferences may also be incorporated into an averaging model (c.f. Meyer, 1981; Yamagishi & Hill, 1983).

Averaging models have the further advantage of accounting for configural patterns in the use of information, such as greater weights for negative or extreme scale values (Birnbaum, 1973, 1974; Birnbaum & Stegner, 1979, 1981; Lynch, 1979). While summative formulations such as that of Fishbein (1967) have theoretical underpinnings in conditioning theory, averaging models have properties that provide interesting parallels to attentional processes and the allocation of cognitive capacity. Weights appear to be affected by classes of variables which would be expected to attract attention to a cue, including the importance of the cue to the dimension of judgment, perceptual salience, and subjective probabilities associated with the cues. Relative weights are also affected by the sheer quantity of cues in much the same way that the relative allocation of cognitive capacity is decreased by the sheer number of demands; the greater the number of cues, the lower the relative weight for any given cue (Anderson, 1982).

The hypothesized model of the evaluation process which includes inferences about missing attributes is discussed in detail in Appendix I. This model is given by

$$r_{IJ} = k_{IJ} + \frac{cw_0 s_0 + cw_I s_{I_i} + cw_J s_{J_j}}{cw_0 + cw_I + cw_J} + \omega |s_{I_i} - s_{J_j}|$$

where

r_{IJ} = the product evaluation in a context in which only information about attributes I and J is usually available

k_{IJ} = a constant to allow for an arbitrary zero and which may be expected to vary with context (the set of attributes for which information which is usually available)

w = the weight given to a cue independent of its relationship with other cues in the set, and which is expected to reflect the perceived importance of the associated attribute to the dimension of judgment

c = the certainty associated with the scale value for an attribute; $c = 1$ when the associated cue is presented and $0 < c < 1$ when the associated cue is inferred. It is assumed to be constant for all inferred values.

s = the scale value associated with an attribute

0 = a subscript indicating the initial impression parameter

ω = a parameter which takes on a negative value, and acts to give greater weight to less attractive information. The greater the difference in attractiveness between two cues to be integrated, the greater is the shift in weight to the less attractive cue.

Briefly, the model assumes that overall evaluations are represented by a weighted average of the initial impression and any attributes that are considered in the evaluation. The weights are determined by the importance of the attribute dimension and the certainty associated with the scale values. Weights are also influenced by the scale values of associated cues, with the least positive cues receiving greater weight. When an inference is made about a missing attribute, the inferred value is averaged in with other cues.

Inferred values depend on the perceived correlations of known attributes with the missing attribute and on the perceived importance of the missing attribute. When the known and missing attributes are not expected to be highly correlated, the inferred scale value is given by

$$s_{I_i(0)} = (e_I)-(fw_I)$$

where

$s_{I_i(0)}$ = the inferred scale value for attribute I when the known and missing information are not thought to be highly correlated

e_I = the expected average value on the attribute dimension I

f = a coefficient which represents the tendency to adjust the prediction as a function of the importance of the missing attribute, and is expected to take on a negative value

w_I = the weight or perceived importance of the missing attribute

When it is expected that there is a high correlation between known and missing information, the inferred value varies with the attractiveness of the known attribute. In the current research, the attributes were chosen so that the inferred values would vary linearly with the attractiveness of known attributes, although this will not always be the case. Therefore, the inferred scale value is given by

$$s_{I_i(J_j)} = (e_{I(J_j)})-(fw_I)$$

where

$s_{I_i(J_j)}$ = the inferred scale value for attribute I when the known and missing information are thought to be highly correlated

f,w = as above

$e_{I(J_j)}$ = the value of attribute I predicted by the linear relationship given level j of attribute J

The value of $e_{I(J_j)}$ is given by

$$e_{I(J_j)} = g_{I/J} + h_{I/J}s_{J_j}$$

where

$g_{I/J}$ = an additive constant

$h_{I/J}$ = the slope of the linear relationship between attributes I and J

s_{J_j} the scale value of level j of attribute J

Expected patterns in overall evaluations. Given this model, it is possible to specify predicted patterns in overall evaluations. Figure 4-1 illustrates hypothetical evaluations of refrigerators based only on information about capacity. These one-attribute descriptions are encountered in one of four contexts: (1) a one-attribute context in which all alternatives are described only in terms of capacity, (2) a two-attribute context in which most alternatives are described in terms of both capacity and warranty, (3) a two-attribute context in which most alternatives are described in terms of capacity and shelf space, and (4) a two-attribute context in which most alternatives are described in terms of capacity and energy cost. Recall that in the evaluations of interest, the refrigerators are described only in terms of capacity. The only difference is the information context in which these one-attribute descriptions are encountered.

In the one-attribute context, in which all alternatives are described only in terms of capacity, it is predicted that no inferences will be made. Evaluations are based only on the presented capacity information. In two-attribute contexts, in which information

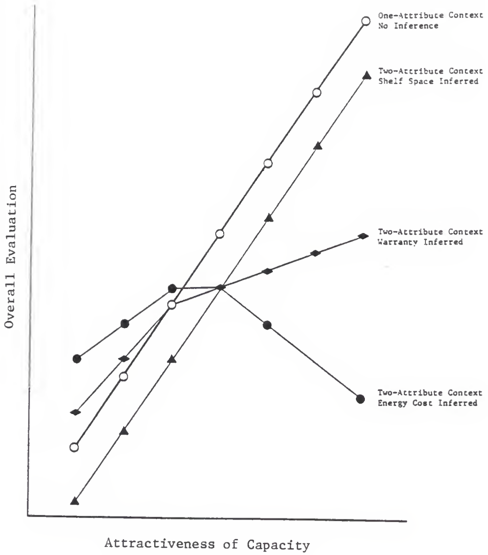

Figure 4-1
Hypothetical Evaluations of Refrigerators
Based on Information about Capacity
Under the Hypothesized Model

is sometimes available about another attribute, it is predicted that inferences will be made about the missing attribute, and that these inferences will influence evaluations.

Two differences may be noted between evaluations posited to contain inferences and those posited not to contain inferences. First, there is a main effect of context, with evaluations posited to contain inferences (two-attribute context) being lower than evaluations posited not to contain inferences (one-attribute context). This is due to the predicted negative bias in inferences.

Second, there is a context x attractiveness of the known attribute interaction, with evaluations posited to contain inferences sometimes exhibiting differences in linear and quadratic trends when compared with evaluations posited not to contain inferences. It is perhaps easiest to think of these differences as differences in the marginal value of capacity as a function of the type of inference process that is occurring.

Evaluations in the one-attribute context are assumed to reflect only the influence of capacity. When inferences are made about warranty, here assumed to have no expected relationship with capacity, there is a decrease in the marginal value of capacity. Warranty inferences which are slightly negative act to increase the attractiveness of small capacities, while decreasing the attractiveness of large capacities. The decrease in marginal value is greater at larger capacities because the negative inference receives greatest weight when combined with very attractive capacities.

When inferences are made about shelf space, here assumed to have a positive correlation with capacity, there is no change in marginal value of capacity relative to when no inferences are made. When inferences are made about energy cost, here assumed to have a negative correlation with capacity (in terms of their evaluative implications), there is a large change in the marginal value of capacity. At small capacities, the marginal value decreases, while at larger capacities, it actually changes from positive to negative. Inferring an attractive energy cost for small capacities and an unattractive energy cost for large capacities would merely reduce the marginal value of capacity if it were not for the assumption of greater weight given to less attractive information. The quadratic trend results from greater weight being given to capacity when it is unattractive and to inferred energy cost when it is unattractive.

These patterns in evaluations are predicted from the judgment model described above. It is possible that inferences are made as predicted, but that other portions of the model are incorrect; for example, less attractive cues may not receive greater weight, or the information may be combined by an additive rather than an averaging processs. Such differences in the process lead to simple systematic effects on the predicted pattern in evaluations. For example, if less attractive cues do not receive greater weight, all differences in trend components become linear differences in the marginal value of capacity, as illustrated in Figure 4-2. When warranty is inferred, the marginal value of capacity decreases, and it remains constant for all capacities. When energy cost is inferred, the marginal value of capacity decreases, but there is now no quadratic trend. Therefore, all differences in trend are linear differences, with the marginal value of capacity being greatest when no inferences are made or when

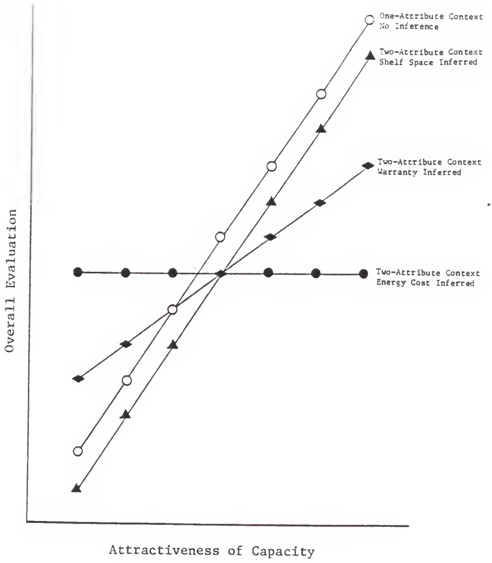

Figure 4-2
Hypothetical Evaluations of Refrigerators
Based on Information about Capacity
Under an Equal Weight Averaging Model

inferences about shelves are made, lower when inferences are made about warranty, and lowest when inferences are made about energy cost.

If an adding model best represents the process, the expected patterns in evaluations are illustrated in Figure 4-3. The marginal value of capacity is still greatest when inferences are made about shelves, next highest when inferences are made about warranty, and lowest when inferences are made about energy cost, but the marginal value of capacity when no inferences are made is now equal to its marginal value when warranty inferences are made.

If inferences do not receive a lower weight, the general patterns are the same, except the effects are stronger. If the function which links known attributes and inferred values has a slope other than approximately 1 or -1 as assumed here, then there will be corresponding differences in the marginal value of capacity when those inferences are made.

Planned comparisons. Planned comparisons examined the main effect of information context and the context x attractiveness of the known attribute interaction. It was predicted that there would be a main effect of context, with evaluations in two-attribute contexts being lower than evaluations in one-attribute contexts. It was also predicted that there would be a context x attractiveness of the known attribute interaction. Relative to evaluations in the one-attribute context, evaluations in the two-attribute context in which there is no expected relationship between known and missing information were predicted to exhibit a decrease in the marginal value of the known attribute, with the decrease being greater for more attractive levels of the known attribute. Evaluations in the two-attribute context in

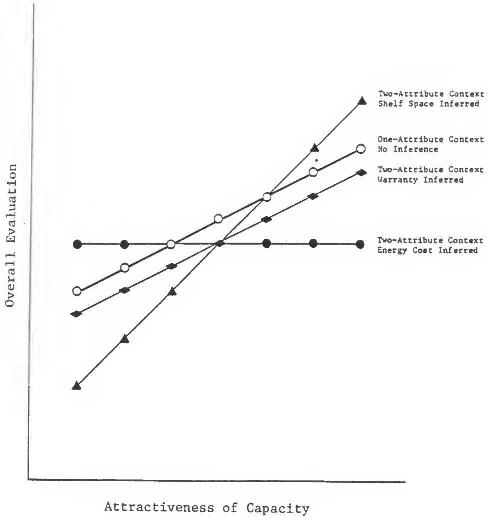

Figure 4-3
Hypothetical Evaluations of Refrigerators
Based on Information about Capacity
Under an Adding Model

which there is a positive correlation between the evaluative implications of known and missing information were predicted to exhibit no change in marginal value relative to evaluations in the one-attribute context. Evaluations in the two-attribute context in which there is a negative correlation between the evaluative implications of known and missing information were predicted to exhibit a quadratic trend, with the marginal value of the known attribute changing from positive to negative at more attractive levels of the known attribute.

Cognitive Effort

Making an inference presumably requires cognitive effort. If this is true, then it would be expected that it would require more cognitive effort to evaluate a product description when inferences are made about missing attributes than when such inferences are not made. In the current context, then, it is predicted that greater effort will be required to evaluate a one-attribute description when it is encountered in a two-attribute context than when it is encountered in a one-attribute context.

Alba and Hutchinson (1985) have suggested that not all inferences require cognitive effort. They have developed a taxonomy of inferences which provides some insight into this issue. In their taxonomy, inferences which generate beliefs about one attribute from information about another attribute are called elaborative inferences. Elaborative inferences may be active or passive.

Active inferences require cognitive effort. The inference maker must first generate a rule for making the inference and apply it to known information to arrive at an inferred value. Passive inferences, on the other hand, are made more or less automatically. The rule for making the inference is stored as a part of the meaning of the known attribute. It is suggested that such a rule is more likely to be stored when there is a high correlation between known and missing information. This implies that the likelihood that an inference will require cognitive effort is an inverse function of the degree of correlation between available and missing information.

In the current theoretical framework, it is proposed that relatively few elaborative inferences are passive. Rather, if a missing attribute is not made salient, inferences are not likely to be made. As suggested by the Alba and Hutchinson framework, the exception may be when there is an extremely high association between two attributes, as is often considered to be the case for price and quality. If the association between price and quality is so strong that price leads to an automatic inference about quality, then it would be expected that quality inferences are not effortful. This implies that quality inferences would be made in an information context in which only price information is ever available. The contextual manipulation of salience would not be necessary to prompt inferences about quality.

Together, product evaluations and cognitive effort data may provide evidence that inferences are or are not occurring as predicted. If there are the predicted systematic differences in evaluations as a function of information context, and if these differences are accompanied by predicted differences in cognitive effort, this would be fairly convincing evidence that inferences are occurring as predicted. To predict differences in the cognitive effort required to evaluate product descriptions, the following model was developed.

A model of cognitive effort in inference making. The effort required to form an evaluation is influenced by factors other than whether or not an inference is being made. Reading, comprehension, and valuation of presented information all require cognitive effort. Some effort is allocated to consideration of the initial impression, to information integration, and to the formation and execution of an overt response. To isolate increases in cognitive effort attributable to inference making, all of these operations must be considered.

Effort required for reading, comprehension, and valuation of presented attribute information may be expected to vary with the attractiveness of that information. Not only does the descriptive text itself differ, but evidence suggests that the attention-demanding properties of cues are related to their scale values. (For a brief discussion of this issue, see Appendix I.)

Effort required to integrate two pieces of information may also vary with the scale values of the cues. It might be hypothesized that a conflict resolution process requires greater effort as the discrepancy between the scale values increases. According to this view, the greater the discrepancy, the more difficult it is to integrate the cues into a single evaluation. Alternatively, it might be hypothesized that the effort required to differentially weight cues decreases with increasing discrepancies. In this view, it is easier to compare scale values with greater discrepancy. If each of these processes occur, the interaction may effectively be zero. Because there are no strong prior expectations about this interaction, it is assumed to be zero.

The components of the judgment task expected to require cognitive effort are shown below.

one known attribute,
two-attribute context $E_{I_i,\text{inf } J} = X_{IJ} + C_{I_i} + G_J + IX_{I_iJ_j} + R$

two known attributes $E_{I_i,J_j} = X_{IJ} + C_{I_i} + C_{J_j} + IX_{I_iJ_j} + R$

one known attribute,
one-attribute context $E_{I_i} = X_I + C_{I_i} + IX_{I_i} + R$

where

$E_{I_i,\text{inf } J}$ = effort required when cue I_i is presented and cue J is inferred

$E_{I_iJ_j}$ = effort required when cues I_i and J_j are both presented

E_{I_i} = effort required when cue I_i is presented and cue J is not inferred

X_{IJ} = effort required to consider the initial impression in a context in which cues I and J are usually available

X_I = effort required to consider the initial impression in a context in which only cue I is usually available

C_{I_i} = effort required for reading, comprehension, and valuation of cue I_i

G_J = the effort required infer the value of J

C_{J_j} = effort required for reading, comprehension, and valuation of cue J_j

$IX_{I_iJ_j}$ = effort required to integrate the initial impression, cue I_i and cue J_j

IX_{I_i} = effort required to integrate the initial impression and cue I_i

R = effort required to make an overt response

Because it is unclear how scale values influence cognitive demands, the following comparisons are averaged across attractiveness levels of attributes.

The effort required to evaluate a one-attribute description in the one-attribute context may be compared with the effort required to evaluate the same description in a two-attribute context. There is no reason to expect that more effort is required to consider the initial impression in two-attribute contexts than in the one-attribute contexts. In fact, it might be hypothesized that the initial impression demands more attention in the one-attribute context where there is less presented information. If it is assumed that there is no difference in the effort allocated to the consideration of the initial impression in these two contexts, this comparison reduces to the difference in the effort required to infer J and integrate it with cue I and the initial impression ($G_J + IX_{IJ}$), and the effort required to integrate cue I and the initial impression (IX_I):

$$\begin{aligned} E_{I,\text{inf } J} - E_I &= (X_{IJ} + C_I + G_J + IX_{IJ} + R) - (X_I + C_I + IX_I + R) \\ &= G_J + IX_{IJ} - IX_I \end{aligned}$$

Because the effort required to integrate information in these two conditions is different only if cue J is inferred, then if cue J is inferred, the effort required is greater than if it is not. Therefore, it is predicted that the cognitive effort required to evaluate a one-attribute description is greater in the two-attribute context than in the one-attribute context.

The effort required to evaluate a two-attribute description in the two-attribute context may be compared with the effort required to evaluate a one-attribute description in the one-attribute context. This comparison reduces to the difference in the effort required to interpret cue J and integrate it with cue I and the initial impression ($C_J + IX_{IJ}$), and the effort required to integrate cue I and the initial impression (IX_I):

$$E_{I,J} - E_I = (X_{IJ} + C_I + C_J + IX_{IJ} + R) - (X_I + C_I + IX_I + R)$$
$$= C_J + IX_{IJ} - IX_I$$

Therefore, it is predicted that the effort required to evaluate a one-attribute description in a one-attribute context is less than the effort required to evaluate a two-attribute description.

Finally, the effort required to evaluate one-attribute and two-attribute descriptions in the two-attribute context may be compared. This comparison reduces to the difference between the effort required for reading, comprehension, and valuation of cue J (C_J), and the effort required to infer cue J (G_J):

$$E_{I,\mathrm{inf}\ J} - E_{IJ} = (X_{IJ} + C_I + G_J + IX_{IJ} + R) - (X_{IJ} + C_I + C_J + IX_{IJ} + R)$$
$$= G_J - C_J$$

If the cognitive effort required to infer J is greater than the effort required to interpret cue J, then the effort required to make an evaluation based on cue I when J is inferred is greater than the effort required to make an evaluation based on cues I and J. If the effort required to infer J is less than the effort required to interpret J, then the opposite is true. Therefore, in the two-attribute context, it is unclear whether one-attribute or two-attribute descriptions will require more effort.

Planned comparisons. In the study described in Chapter IX, a measure of cognitive effort was taken during the product evaluation task. (A response latency measure was used.) Planned comparisons examined the difference in cognitive effort required to evaluate one-attribute descriptions in one-attribute contexts, one-attribute descriptions in two-attribute contexts, and two-attribute descriptions. It was predicted that the effort required to evaluate a one-attribute description in the one-attribute context would be less than the effort required to evaluate a two-attribute description or a one-attribute description in a two-attribute context. It is unclear which of these last two descriptions should require greater effort. Perhaps strongest evidence of an inference making process would be obtained if the one-attribute description in a two-attribute context actually requires more effort than a two-attribute description, but there is no strong theoretical basis upon which to make this prediction.

Verbal Protocols

Product evaluations and cognitive effort data provide only indirect evidence about underlying cognitive processes. One method of more directly examining cognitive processes is to ask subjects to verbalize their thoughts, either concurrently with evaluations or retrospectively after having completed the evaluation task. It would be expected that subjects who made inferences about missing attributes would report that they had done so. Such data could provide strong support that inferences are being made as predicted.

In the following studies, retrospective verbal protocols were obtained following the product evaluation task. Planned comparisons examined differences in the incidence of inference making as a function of information context. It was predicted that the incidence of inference making would be low in the one-attribute context and high in the two-attribute context.

The validity of verbal protocols as data has been questioned on the grounds that individuals are often either unaware of their cognitive processes or otherwise unable to report correctly the nature of these processes (Nisbett & Wilson, 1977). As the inferences of interest are not passive inferences which occur automatically, but rather active inferences which are posited to be made very deliberately, it seems unlikely that subjects would be unaware of the process.

Ericsson and Simon (1980) have developed a conceptual framework which considers the information processing mechanisms by which verbal reports are generated in order to identify the methodological factors which lead to incompleteness and inaccuracies in such data. After an extensive review of the literature, they conclude that verbalization generates valid data if the verbalization procedure draws only on information which would be available in short term memory at the time of the report. Inaccuracies result from requesting information that was never part of the process or which is no longer available in short term memory, so that reports are subject to biases in encoding and retrieval processes.

Retrospective verbalizations, of course, must rely on information that is no longer available in short term memory. For this reason, comparative concurrent verbalizations were collected for one group of subjects to ascertain whether the retrospective protocols were subject to biases which would alter the interpretation of results. This study as well as a detailed discussion of the issue of the relative validity of concurrent and retrospective verbalizations is contained in Chapter VIII.

Summary

In the series of studies to be reported in subsequent chapters, subjects evaluated hypothetical catalog descriptions of products. These descriptions were provided in a context in which alternatives were always described in terms of one attribute (one-attribute context) or in a context in which alternatives were typically described in terms of two attributes (two-attribute context). In the evaluations of interest, information was provided about only one attribute. In one-attribute contexts, it was expected that no inferences would be made about other product attributes. In the two-attribute contexts, it was expected that inferences would be made about the missing attribute.

Two-attribute contexts were constructed so that there was either no expected relationship, a positive correlation, or a negative correlation between the evaluative implications of known and missing information. It was expected that inferences would vary as a function of these expected relationships.

Three types of data were examined for evidence of the proposed inference process. First, product evaluations were examined for patterns predicted by the inference model. It was predicted that evaluations in the two-attribute context would be lower than the corresponding evaluations in the one-attribute context, and that the marginal value of the known attribute would vary systematically as a function of the expected relationship between known and missing information. Second, for a subset of subjects, the cognitive effort required to evaluate the products was measured. It was expected that making an inference would require cognitive effort, and therefore that greater effort would be required to evaluate a description in the two-attribute context than in the one-attribute context. Finally, verbal protocols were collected and examined for evidence of inference making. It was predicted that the incidence of inference making would be low in the one-attribute context and high in the two-attribute context.

CHAPTER V
DEVELOPMENT OF STIMULUS MATERIALS

The major independent variables in the current research are information context and the expected relationship between known and missing information. These variables are manipulated by the set of product descriptions a subject is asked to evaluate. For subjects in one-attribute contexts, all alternatives are described in terms of only one attribute. For subjects in two-attribute contexts, most alternatives are described in terms of two attributes. The attributes which are paired in two-attribute contexts determine the expected relationship between known and missing information. Attribute pairs are chosen so that there is either no expected relationship, a perceived positive correlation, or a perceived negative correlation between attributes. This chapter describes the selection of attribute pairs with these expected relationships.

The price-quality relationship is the prototypical example of attributes which are thought to be negatively correlated in terms of their evaluative implications. Researchers often assume that price is commonly used to infer a number of other product attributes such as features, performance, and general quality. If this assumption is correct, then price information should prompt inferences about other product attributes regardless of information context. This is contrary to Hypothesis 1, which predicts that inferences are unlikely to be made in one-attribute contexts. Because there is a large body of literature which has examined the price-quality relationship (Monroe, 1973), and because it is commonly assumed that price more or less automatically prompts inferences, it was decided to employ two attributes to represent the negative correlation condition: price and another attribute with less generality across product classes. In this way, it would be possible to determine if price is different from other product attributes in its propensity to prompt inferences.

It was also decided to employ two product classes throughout this research. This strategy is Cook and Campbell's (1979) model of deliberately sampling for heterogeneity. If the manipulations have similar effects in different product classes, confidence in the external validity of the findings is increased. Pretesting suggested that the product classes of refrigerators and steam carpet cleaners could provide the needed manipulation of expected relationships between attributes. The following study was designed to determine whether the selected attributes were perceived to be related as predicted.

Method

Subjects

Subjects were 200 undergraduate psychology students who participated in partial fulfillment of a course requirement.

Materials

A sample questionnaire for the refrigerator product class is in Appendix II. It consists of a general description of the research, an informed consent form, task instructions, and the actual rating tasks.

The tested sets of attributes for each product class are given in Table 5-1. For the refrigerator product class, capacity was predicted to be perceived to have no relationship with warranty, a positive correlation with shelf space, and negative correlations with energy cost and price. For carpet cleaners, the area cleaned per refill was predicted to be perceived to have no relationship with versatility (types of carpets on which the cleaner may be used), a positive correlation with tank capacity, and negative correlations with operating weight (weight when the tank is full) and price.

For each attribute, descriptions were constructed to vary in attractiveness across four levels: (1) very unattractive, (2) moderately unattractive, (3) moderately attractive, and (4) very attractive. These descriptions are shown in Tables 5-2 and 5-3 for refrigerators and carpet cleaners, respectively.

Dependent Variables

Attribute attractiveness. Attribute descriptions were rated on a 7-point scale from -3 (very unattractive) to +3 (very attractive).

Expected relationships. Expected relationships between attributes were measured in two ways. First, subjects were asked to choose one of three multiple choice responses which best indicated how they think a given pair of attributes are related. This question assessed beliefs about the objective correlations between attributes, as distinguished from correlations between the evaluative implications of attributes. Alternatives were always (a) a positive correlation, (b) a negative correlation, or (c) no relationship, as in the following example:

Table 5-1
Expected Relationships between Attributes

Expected Relationship	Product Class	
	Refrigerators	Carpet cleaners
No relationship	Capacity and warranty	Area cleaned and versatility
Positive correlation	Capacity and shelf space	Area cleaned and tank capacity
Negative correlation	Capacity and energy cost	Area cleaned and weight
Negative correlation	Capacity and price	Area cleaned and price

Table 5-2
Refrigerator Attribute Descriptions

Attribute	Attractive-ness*	Description
Warranty	--	2 months warranty
	-	4 months warranty
	+	18 months warranty
	++	2 years warranty
Shelf space	--	1 full shelf, no door shelves
	-	2 full shelves, no door shelves
	+	3 full shelves, 2 door shelves
	++	4 full shelves, 3 door shelves
Energy cost	--	$20/month average energy cost
	-	$12/month average energy cost
	+	$6/month average energy cost
	++	$2/month average energy cost
Price	--	$1600 price
	-	$1200 price
	+	$500 price
	++	$350 price
Capacity	--	4 cu. ft. refrigerator capacity
	-	6 cu. ft. refrigerator capacity
	+	18 cu. ft. refrigerator capacity
	++	25 cu. ft. refrigerator capacity

* -- very unattractive
- moderately unattractive
+ moderately attractive
++ very attractive

Table 5-3
Carpet Cleaner Attribute Descriptions

Attribute	Attractiveness*	Description
Versatility	--	suitable only for outdoor type carpets
	-	suitable only for short pile synthetic carpets
	+	suitable for most carpets
	++	suitable for all carpets and rugs
Tank capacity	--	extra small tank holds .3 gal. cleaning solution
	-	small tank holds .5 gal. cleaning solution
	+	medium tank holds 1.5 gal. cleaning solution
	++	large tank holds 2.0 gal. cleaning solution
Weight	--	weighs 50 lbs. when tank is full
	-	weighs 35 lbs. when tank is full
	+	weighs 20 lbs. when tank is full
	++	weighs 12 lbs. when tank is full
Price	--	$500 price
	-	$300 price
	+	$125 price
	++	$80 price
	--	cleans .25 average size room/refill
	-	cleans .75 average size room/refill
	+	cleans 2.25 average size room/refill
	++	cleans 3.00 average size room/refill

* -- very unattractive
- moderately unattractive
+ moderately attractive
++ very attractive

For most refrigerators, it is generally true that

a. the greater the refrigerator capacity, the higher the average energy cost

b. the greater the refrigerator capacity, the lower the average energy cost

c. there is little relationship between refrigerator capacity and average energy cost

Expected relationships between attributes were also assessed in a direct rating task. Subjects were given a one-attribute product description. Then they were asked to infer the value of a missing attribute and to rate the attractiveness of the inferred attribute. Correlations between the rated attractiveness of the known attribute and the rated attractiveness of the inferred attribute indicate the perceived correlation between the evaluative implications of the attributes. An example is given below:

What is Known about Refrigerator	Attractiveness of Imagined AVERAGE ENERGY COST
18 cu. ft. refrigerator capacity	3 2 1 0 -1 -2 -3
6 cu. ft. refrigerator capacity	3 2 1 0 -1 -2 -3
4 cu. ft. refrigerator capacity	3 2 1 0 -1 -2 -3
25 cu. ft. refrigerator capacity	3 2 1 0 -1 -2 -3

The hypotheses to be tested are concerned with expected relationships between evaluative implications of attributes. The multiple choice question regarding the objective correlation between attributes was introduced when it was discovered that pretest subjects had difficulty understanding the direct rating task. The objective correlation question seems to make the direct rating task easier, perhaps by making an intermediate step in the judgment process explicit. Responses to the multiple choice questions also provide independent verification of the expected relationships between attributes.

Design

Product class (refrigerators and carpet cleaners) was a between subjects factor. Attractiveness of attribute descriptions (very unattractive, moderately unattractive, moderately attractive, and very attractive), inferred attribute (all five attributes for the product class), and known attribute (the four attributes other than the one to be inferred) were varied within subjects.

For the attractiveness ratings, the order of the attributes and of the four attractiveness levels of each attribute were randomized, and were the same for each subject.

For questions which assessed expected relationships, the order of the known attributes was randomized separately for each inferred attribute, and was the same for every subject. In the direct rating tasks, the order of the four attractiveness levels of each known attribute were also randomized, and were the same for every subject. All multiple choice and direct ratings questions for a given inferred attribute were placed together on the same page. The order of presentation of these pages was counterbalanced across subjects.

Procedure

Subjects were administered the questionnaires individually or in small groups. The experimenter gave general instructions about working carefully.

Results

Attractiveness Ratings

Mean attractiveness ratings for refrigerator attributes are in Table 5-4. Mean attractiveness ratings for carpet cleaner attributes are in Table 5-5. The descriptions were perceived as varying from very unattractive to very attractive as intended.

Expected Relationships

Multiple choice questions. Responses were recoded to reflect the perceived relationship between the evaluative implications of attributes. For example, if a subject reported a positive correlation between the objective values of capacity and energy cost, this was recoded as a negative correlation, because attractiveness ratings indicated a preference for larger capacities and lower energy costs. Percentages of subjects indicating no relationship, a positive correlation, and a negative correlation for each attribute pair are reported in Tables 5-6 and 5-7 for refrigerators and carpet cleaners, respectively. For each attribute pair, at least 71% of the subjects reported expected relationships consistent with predictions.

Direct rating questions. Pearson product-moment correlation coefficients were calculated between attractiveness ratings of known attributes and attractiveness ratings of inferred attributes. Overall correlations and slopes and median correlations and slopes are reported in Tables 5-6 and 5-7 for refrigerators and carpet cleaners, respectively.

Overall correlations and slopes are generally consistent with reported expected relationships. For attribute pairs reported to be positively correlated, there is a high positive correlation and a high

Table 5-4
Mean Attractiveness Ratings for Refrigerator Attributes

	Attractiveness*			
Attribute	--	-	+	++
Capacity	-2.09	-1.38	1.79	2.31
Warranty	-2.42	-1.64	1.60	2.79
Shelf space	-2.54	-1.60	1.64	2.52
Energy cost	-2.41	- .73	1.67	2.91
Price	-2.36	-1.25	1.34	1.90

* -- very unattractive
- moderately unattractive
+ moderately attractive
++ very attractive

Table 5-5
Mean Attractiveness Ratings for Carpet Cleaner Attributes

	Attractiveness*			
Attribute	--	-	+	++
Area cleaned	-2.57	-1.30	1.48	2.62
Versatility	-2.05	-1.56	1.60	2.84
Tank capacity	-1.87	- .97	1.66	1.96
Weight	-1.98	- .61	1.09	2.09
Price	-2.51	-1.72	.80	2.21

* -- very unattractive
- moderately unattractive
+ moderately attractive
++ very attractive

Table 5-6
Expected Relationships between Refrigerator Attributes

		Percent Indicating*					Medians	
Known Attribute	Inferred Attribute	0	+	-	r	Slope	r	Slope
Capacity	Warranty	75	20	5	.33	.20	0.00	0.00
Capacity	Shelf space	7	92	1	.83	.80	.98	.92
Capacity	Energy cost	4	4	92	-.58	-.55	-.97	-.89
Capacity	Price	1	1	98	-.60	-.55	-.95	-.81
Warranty	Capacity	85	12	3	.47	.25	0.00	0.00
Shelf space	Capacity	12	86	2	.80	.72	.98	.88
Energy cost	Capacity	11	2	87	-.61	-.54	-.95	-.76
Price	Capacity	4	1	95	-.59	-.54	-.96	-.72

* 0 No relationship
+ Positive correlation
- Negative correlation

Table 5-7
Expected Relationships between Carpet Cleaner Attributes

		Percent Indicating*					Medians	
Known Attribute	Inferred Attribute	0	+	-	r	Slope	r	Slope
Area cleaned	Versatility	71	17	6	.48	.27	0.00	0.00
Area cleaned	Tank capacity	2	96	2	.81	.77	.98	.92
Area cleaned	Weight	17	0	83	-.24	-.2	-.86	-.48
Area cleaned	Price	10	2	86	-.31	-.26	-.93	-.50
Versatility	Area cleaned	81	15	4	.41	.26	0.00	0.00
Tank capacity	Area cleaned	1	98	1	.75	.78	.97	1.00
Weight	Area cleaned	19	2	79	-.41	-.36	-.89	-.65
Price	Area cleaned	28	1	71	-.33	-.27	-.90	-.54

* 0 No relationship
+ Positive correlation
- Negative correlation

positive slope. For attribute pairs reported to be negatively correlated, there is a negative correlation and a negative slope. For attribute pairs reported to be unrelated, however, there is generally a low positive correlation and low positive slope. This may represent a tendency to make evaluatively consistent inferences when there is no expected relationship between known and inferred attributes. Dick (1985) also observed this tendency in prompted inferences.

Median correlations and slopes, which are probably a better indication of central tendency, are quite consistent with reported expected relationships. All attribute pairs reported to be positively correlated have positive median correlations of at least .97 (inferring tank capacity from area cleaned), and median positive slopes of at least .88 (inferring capacity from shelf space). All attribute pairs reported to be negatively correlated have negative median correlations of at least -.89 and negative median slopes of at least -.48 (both for inferring area cleaned from weight). All attribute pairs reported to be unrelated have median correlations and slopes of 0. This suggests that the strategy of making evaluatively consistent inferences for these pairs was not universal.

Order Effects in Prompted Inferences

Subjects were asked to make inferences about five different attributes. Repeatedly performing this task may make subjects more or less sensitive to expected correlations between attributes. For example, deciding that refrigerator capacity and price are negatively correlated may make it more likely that it will subsequently be decided that capacity and energy cost are also negatively correlated. If such order effects occurred, the correlations between known and inferred attributes reported above, which are based on data from all presentation orders, may not correctly indicate how attributes are generally thought to be related.

For this reason, the order of inferred attributes was counterbalanced across subjects, making possible a partial assessment of order effects. (The order of known attributes was randomized for each inferred attribute, so effects due to the order of known attributes cannot be isolated.) This analysis, described in detail in Appendix III, indicated that order effects were not widespread, and did not have a large impact on correlations based on all of the data. It was concluded that the correlations reported above are a good indication of general beliefs about how attribute pairs are related.

Discussion

The chosen attribute pairs in both the refrigerator and carpet cleaner product classes are perceived to be related as hypothesized. When considered in terms of evaluative implications, refrigerator capacity is perceived as having no relationship with warranty, a positive correlation with shelf space, and a negative correlation with both energy cost and price. Carpet cleaner area cleaned is perceived as having no relationship with versatility, a positive correlation with tank capacity, and a negative correlation with weight and price. These expectations were verified by a multiple choice task in which subjects indicated how they thought attribute pairs were related, and by a direct ratings task in which subjects were prompted to make inferences about one attribute based on information about another attribute. An analysis of order effects indicated that these expectations were relatively stable, and not subject to great changes depending upon prior exposure to other attribute combinations.

Chapter VI describes a experiment which uses these attribute pairs to manipulate the expected relationships between known and missing information to test Hypotheses 1 and 2.

CHAPTER VI
EXPERIMENT I

It is hypothesized that inferences are commonly made about salient missing attributes. Data which may provide evidence about this proposition include overall evaluations, verbal protocols of the evaluation process, and a measure of the cognitive effort expended in making evaluations. (See Chapter IV for a detailed discussion of these measures.) As the data collection methodology for verbal protocols and cognitive effort measures is fairly complex, an experiment was designed to collect overall evaluations and some simple protocols.

Method

Overview

It is proposed that inferences are made about salient missing attributes and integrated with known information to arrive at an overall evaluation. If this proposition is correct, evaluations made when a missing attribute is salient should be systematically different from evaluations made when the missing attribute is not salient.

Theoretically, the information context in which product information is encountered is a major determinant of the salience of missing attributes. If information is typically available about an attribute, the attribute becomes salient, and it is likely that its value will be inferred when it is not known. If information is not typically available about an attribute, the attribute is not likely to be salient, and it is unlikely that its value will be inferred when it is not known.

Such a manipulation of information context is employed in the current study. A set of simple one-attribute product descriptions, hereafter referred to as the test descriptions, are encountered in one of two information contexts. In one-attribute contexts, all alternatives to be evaluated are described only in terms of the attribute contained in the test descriptions. In two-attribute contexts, most alternatives to be evaluated are described in terms of two attributes: the attribute contained in the test descriptions, and one other attribute.

Interest focuses on evaluations of the test descriptions. In one-attribute contexts, information is never available about an attribute not contained in the test descriptions. Therefore, no other attributes are salient, and no inferences are made about missing attributes. In two-attribute contexts, information is typically available about an attribute not contained in the test descriptions. Therefore, the missing attribute is salient, and it is likely that its value will be inferred.

It is predicted, then, that evaluations of the test descriptions will vary systematically as a function of information context. In one-attribute contexts, evaluations of the test descriptions will be influenced only by the attractiveness of the known attribute, while in two-attribute contexts, evaluations will be influenced both by the attractiveness of the known attribute and the inferred attractiveness of the salient missing attribute.

Subjects

Subjects were 80 undergraduate psychology students who participated in partial fulfillment of a course requirement.

Materials

The data were collected via a questionnaire. The questionnaire included a brief description of the research, an informed consent form, task instructions, and the actual product evaluation task. A sample questionnaire is in Appendix II.

The task was presented as one of examining a catalog in anticipation of a purchase. As in a catalog, all of the alternatives in a product class were grouped together on the same page, each preceeded by a unique catalog number. As in many catalogs, each product class was introduced by a general description of the product class and of features common to all models in the catalog. This general description served to create a richer impression of the products than afforded by the simple one- and two-attribute descriptions of individual alternatives. Care was taken not to include information about attributes which would be perceived as highly correlated with other product attributes.

For refrigerators, the general description was as follows:

> All of the refrigerators in this catalog are intended for family use. Although the refrigerators come from a variety of different manufacturers, all models include lighted interior, adjustable cold control, reversible flush hinged doors with magnetic gaskets, and are available in a number of exterior colors and finishes. All are UL listed for 110-120-v., 60-Hz. AC.

For carpet cleaners, the general description was as follows:

> Although they come from a variety of different manufacturers, all of the steam carpet cleaners in this catalog are canister models with casters which allow them

> to roll across carpeted floors. All are constructed of high impact plastic. To operate, the supply tank must be filled with a cleaning solution of water and specially formulated carpet cleaner. A heating element maintains the cleaning solution at 120° F. A water pump motor sprays the cleaning solution while a wet pickup motor removes the solution from the carpet. All are UL listed for 110-120-v., 60-Hz. AC.

All descriptions of individual alternatives were constructed from the attribute descriptions presented in Chapter V. Details of how two-attribute descriptions were created are given below.

Design

The design is illustrated in Table 6-1. Product class was a within subjects factor. Every subject evaluated a set of refrigerators and a set of carpet cleaners.

Within each product class, there were nine different information contexts. Five of the contexts were one-attribute contexts, in which all alternatives were described in terms of only one attribute. Four of the contexts were two-attribute contexts, in which most alternatives were described in terms of two attributes. Two-attribute contexts may be classified according to the expected relationship between the two attributes. The two attributes may be expected to be unrelated, positively correlated, or negatively correlated in terms of their evaluative implications.

Information context within a product class was varied between subjects, so that each subject was exposed to only one context for each product class. For every subject, alternatives for one product class were presented in a one-attribute context, while alternatives for the other product class were presented in a two-attribute context. Order of information contexts was counterbalanced across subjects so

Table 6-1
Design

	One-Attribute Context: Carpet Cleaners				
Two-Attribute Context: Refrigerators	Area Cleaned	Versa-tility	Tank Capacity	Weight	Price
Capacity & Warranty (no relationship)	1	3	5	7	9
	2	4	6	8	10
Capacity & Shelf Space (positive correlation)	11	13	15	17	19
	12	14	16	18	20
Capacity & Energy Cost (negative correlation)	21	23	25	27	29
	22	24	26	28	30
Capacity & Price (negative correlation)	31	33	35	37	39
	32	34	36	38	40

	One-Attribute Context: Refrigerators				
Two-Attribute Context: Carpet Cleaners	Capacity	Warranty	Shelf Space	Energy Cost	Price
Area cleaned & versatility (no relationship)	41	43	45	47	49
	42	44	46	48	50
Area cleaned & tank capacity (positive correlation)	51	53	55	57	59
	52	54	56	58	60
Area cleaned & energy cost (negative correlation)	61	63	65	67	69
	62	64	66	68	70
Area cleaned & price (negative correlation)	71	73	75	77	79
	72	74	76	78	80

Note: Table entries are subject numbers. Odd-numbered subjects evaluated alternatives in the one-attribute context first. Even-numbered subjects evaluated alternatives in the two-attribute context first.

that every context appeared first once and second once for each context with which it was paired.

Attractiveness of test descriptions was varied within subjects (very unattractive, moderately unattractive, moderately attractive, and very attractive).

In one-attribute contexts, the only alternatives to be evaluated were the four test descriptions for that attribute. In two-attribute contexts, subjects evaluated 24 alternatives. Sixteen of the alternatives were two-attribute descriptions which were created by factorially combining the four attractiveness levels of the two attributes. Four alternatives were the test descriptions for the first attribute in the context, and the remaining four were the test descriptions for the second attribute in the context.

Each subject evaluated each description twice, for a total of 56 separate product evaluations. The order of presentation of descriptions was randomized, but was the same for all subjects in a given information context.

Dependent Variables

Product evaluations. Product descriptions were rated on a 7-point scale from -3 (very unattractive) to +3 (very attractive).

Retrospective comments. After completing the product evaluation task, subjects were asked to recall the thought processes involved in evaluating three of the test descriptions: one from the one-attribute context and one for each attribute from the two-attribute context.

Procedure

Subjects were administered the questionnaire as a group during a regular class meeting. The experimenter gave general instructions about working carefully.

Results

Product Evaluations

Interest focuses on evaluations of the test descriptions. Test descriptions were encountered in one of two information contexts. In one-attribute contexts, it was predicted that no inferences would be made about missing attributes. In two-attribute contexts, it was predicted that inferences would be made about missing attributes. If these predictions are correct, two differences in evaluations between information contexts should be observed.

First, there should be a main effect of context. Evaluations in the two-attribute context should be less favorable than evaluations in the one-attribute context. This difference is due to the predicted negative bias in inferences, which are predicted to be made only in the two-attribute context.

Second, a context x attractiveness of the known attribute interaction should be observed. Evaluations in the two-attribute context, which include inferences about missing attributes, should exhibit systematic differences in linear and quadratic trends when compared with evaluations in the one-attribute context. The exact nature of these predicted differences depends upon the expected relationship between known and missing attributes.

These predictions are based on the assumption that inferred values are integrated with known information in a manner best represented by an averaging model which gives greater weight to less attractive information. The validity of this model of the integration process may be partially ascertained by examining evaluations of two-attribute descriptions and of one-attribute descriptions from one-attribute contexts. A graphical analysis, described in Appendix IV, indicates that the hypothesized model represents the integration process reasonably well.

Main effect of context. Evaluations in the two-attribute context were predicted to be less favorable than evaluations in the one-attribute context. Means and _F_ statistics for these planned comparisons are in Tables 6-2 and 6-3 for refrigerators and carpet cleaners, respectively. Detailed summary tables are in Appendix IV.

The prediction received limited support. Although most differences in means were in the predicted direction, the effect was significant in only four of the 16 cases tested. Evaluations were significantly less favorable in the two-attribute context than in the one-attribute context when refrigerator capacity was known and warranty or shelf space was missing, and when carpet cleaner tank capacity or weight was known and area cleaned was missing. Three other comparisons were marginally significant: when refrigerator shelf space was known and capacity was missing, when carpet cleaner area cleaned was known and weight was missing, and when carpet cleaner versatility was known and area cleaned was missing.

Context x attractiveness interaction. When compared with evaluations in the one-attribute context, evaluations in the

Table 6-2
Context Main Effect for Refrigerators

Known Attribute	Missing Attribute (Two-Attribute Context)	Test Description Means			
		One-Attribute Context	Two-Attribute Context	*F*	*p*
Capacity	Warranty	.56	-.75	15.12*	.0016
Capacity	Shelf space	.56	-.74	9.55*	.0080
Capacity	Energy cost	.56	.48	.06	.8152
Capacity	Price	.56	.06	2.50	.1362
Warranty	Capacity	.13	-.48	2.03	.1759
Shelf space	Capacity	.17	-.74	4.24	.0587
Energy cost	Capacity	.39	.50	.18	.6804
Price	Capacity	.31	-.16	1.50	.2405

$^{*}p < .05$

Table 6-3
Context Main Effect for Carpet Cleaners

Known Attribute	Missing Attribute (Two-Attribute Context)	Test Description Means			
		One-Attribute Context	Two-Attribute Context	*F*	*p*
Area cleaned	Versatility	0.00	-.33	.39	.5445
Area cleaned	Tank capacity	0.00	.05	.08	.7810
Area cleaned	Weight	0.00	-.31	3.36	.0883
Area cleaned	Price	0.00	-.24	1.14	.3047
Versatility	Area cleaned	.56	-.35	4.29	.0574
Tank capacity	Area cleaned	.39	-.28	5.96*	.0285
Weight	Area cleaned	.05	-.93	6.61*	.0222
Price	Area cleaned	-.33	-.33	0.00	.9926

$^{*}p < .05$

two-attribute context were predicted to exhibit systematic differences in linear and quadratic trends which reflect the influence of inferences on these evaluations. In general, these predictions were not supported.

Evaluations of the test descriptions which provide only information about refrigerator capacity will be considered first. Evaluations made in the one-attribute context may be compared with evaluations made in four different two-attribute information contexts. Predicted patterns are illustrated in Figure 6-1. In the two-attribute context in which information is typically available about both capacity and warranty, it was expected that warranty would be inferred when it was missing. Capacity is perceived to be unrelated to warranty. When the known attribute is perceived to be unrelated to the missing attribute, it is predicted that the missing attribute will be inferred to be somewhat unattractive. If a somewhat negative inference about warranty is averaged in with known capacities, evaluations of very unattractive capacities become more favorable, while evaluations of attractive capacities become less favorable.

The effect is not constant for all capacities, however. When information is averaged together, the model predicts that greater weight is given to the least attractive cue. The greater the discrepancy between the attractiveness of the cues to be averaged, the greater is the increase in weight for least attractive cue. In the current case, the greatest discrepancy between the attractiveness of the slightly negative inference and the attractiveness of the known capacity occurs when capacity is at its most attractive levels.

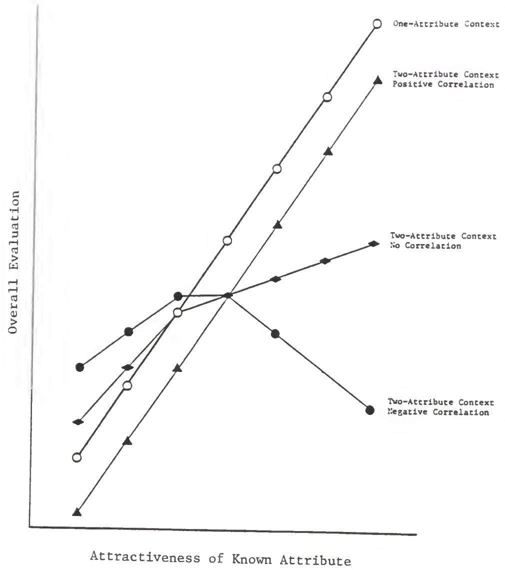

Figure 6-1
Predicted Patterns in Evaluations
as a Function of the Expected Correlations
Between the Evaluative Implications
of the Known Attribute and Missing Attribute

Therefore, evaluations of attractive capacities are lowered more by the slightly negative warranty inference than evaluations of unattractive capacities are raised by this inference.

When evaluations are plotted as a function of the attractiveness of the known attribute, this effect is indicated by a less steep slope in the two-attribute context, with the slope being least steep at attractive levels of the known attribute. Planned comparisons should indicate a significant difference in both linear and quadratic trends between the one- and two-attribute contexts.

These predictions were not supported. Observed evaluations of test descriptions which provide information only about capacity are plotted in Figure 6-2. When compared to evaluations in the one-attribute context, evaluations predicted to include inferences about warranty do not have a less steep slope overall, although the slope is less steep at higher attractiveness levels of capacity. Planned comparisons are in Table 6-4. Differences in both linear and quadratic trends were nonsignificant.

In the two-attribute context in which information is typically available about capacity and shelf space, it was expected that shelf space would be inferred when it was missing. Capacity and shelf space are perceived to be positively correlated in terms of their evaluative implications. When the known attribute is perceived to be positively correlated with the missing attribute, it is predicted that the missing attribute will be inferred to be somewhat less attractive than the known attribute. Although greater weight is given to the less attractive inference than to the known attribute, relative weights are constant because the discrepancy between the attractiveness of the

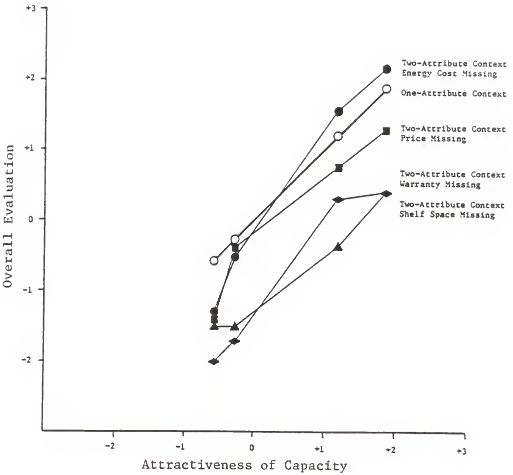

Figure 6-2
Refrigerator Evaluations
Based on Information about Capacity

Table 6-4
Context x Attractiveness of Known Attribute Interaction for Refrigerators

Known Attribute	Missing Attribute (Two-Attribute Context)	Linear			Quadratic		
		Predicted	F	p	Predicted	F	p
Capacity	Warranty	yes	.02	.8881	yes	1.01	.3331
Capacity	Shelf space	no	.16	.6920	no	.24	.6337
Capacity	Energy cost	yes	.74	.4031	yes	.66	.4303
Capacity	Price	yes	0.00	.9781	yes	.88	.3638
Warranty	Capacity	yes	7.73*	.0147	yes	.04	.8363
Shelf space	Capacity	no	22.81*	.0003	no	.09	.7692
Energy cost	Capacity	yes	.40	.5382	yes	.11	.7410
Price	Capacity	yes	1.48	.2446	yes	.21	.6501

*$p < .05$

known attribute and the negatively biased inference is constant. Therefore, although inferences lower overall evaluations, the effect is constant for all attractiveness levels of capacity.

When evaluations are plotted as a function of the attractiveness of the known attribute, this effect is indicated by identical slopes in the one- and two-attribute contexts. Planned comparisons should indicate no difference in linear or quadratic trends between the two contexts.

These predictions were generally supported. When compared with evaluations in the one-attribute context, evaluations predicted to include inferences about shelf space are, with a slight discrepancy, similar in slope. As predicted, differences in linear and quadratic trends were nonsignificant.

In the two-attribute context in which information was typically available about capacity and energy cost, it was expected that energy cost would be inferred when it was missing. Capacity and energy cost are perceived to be negatively correlated in terms of their evaluative implications. When the known and missing attributes are perceived to be negatively correlated, it is predicted that the missing attribute will be inferred to be attractive when the known attribute is unattractive and unattractive when the known attribute is attractive. Because greater weight is given to less attractive cues, the known attribute receives greater weight when it is unattractive, and the inference receives greater weight when it is unattractive.

When evaluations are plotted as a function of the attractiveness of the known attribute, this effect is indicated by an inverted U-shaped curve in the two-attribute context. Planned comparisons should indicate a significant difference in both linear and quadratic trends between the one- and two-attribute contexts.

These predictions were not supported. The slope in the two-attribute context is steeper than it is in the one-attribute context, although planned comparisons indicated no significant differences in linear or quadratic trends.

In the two-attribute context in which information was typically available about both capacity and price, it was expected that price would be inferred when it was missing. Because capacity and price are perceived to be negatively correlated in terms of their evaluative implications, predictions were identical to those for energy cost. These predictions were not supported. Evaluations in the two-attribute context do not resemble an inverted U, and planned comparisons indicated no significant differences in either linear or quadratic trends between one- and two-attribute contexts.

All of the comparisons described so far involve test descriptions which provided information only about capacity. Subjects also evaluated four other sets of test descriptions which provided information about warranty, shelf space, energy cost, and price, respectively. When these descriptions were encountered in two-attribute contexts in which information was typically also available about capacity, it was predicted that inferences would be made about capacity. Depending upon the expected relationship between the known and missing attributes, these inferences were predicted to result in patterns in evaluations identical to those described above.

Figures 6-3 through 6-6 show evaluations based on information about warranty, shelf space, energy cost, and price, respectively.

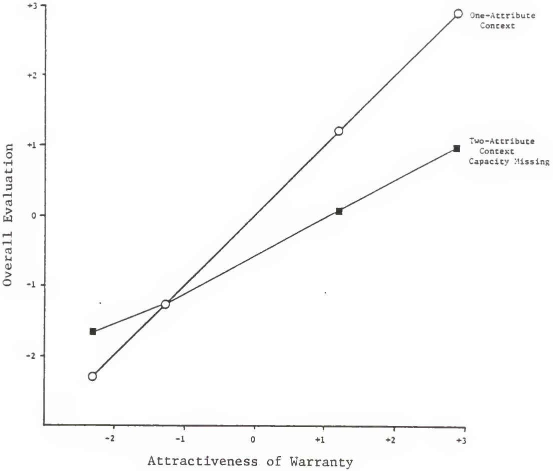

Figure 6-3
Refrigerator Evaluations
Based on Information about Warranty

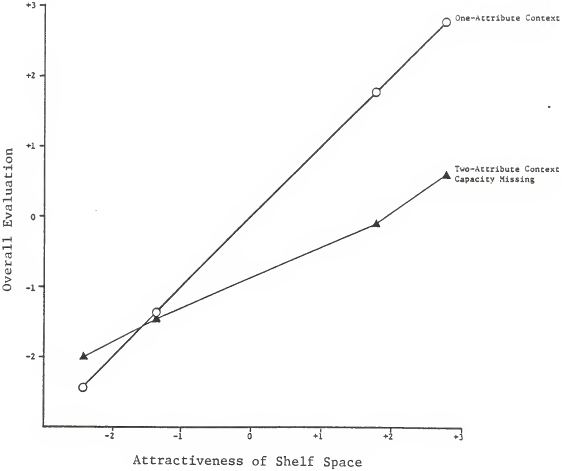

Figure 6-4
Refrigerator Evaluations
Based on Information about Shelf Space

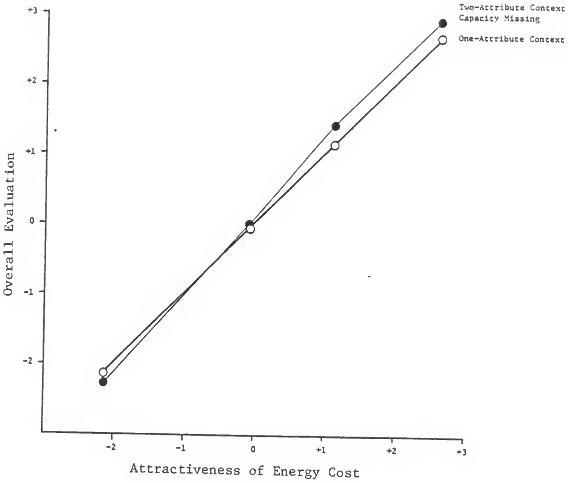

Figure 6-5
Refrigerator Evaluations
Based on Information about Energy Cost

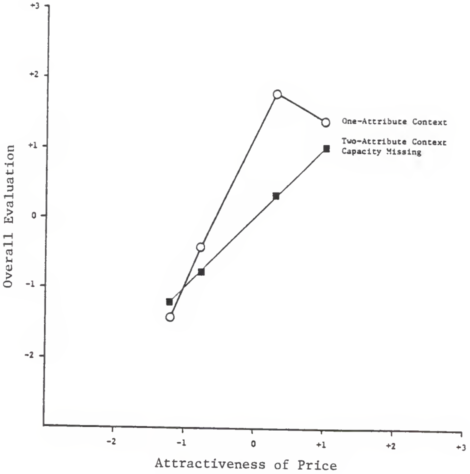

Figure 6-6
Refrigerator Evaluations
Based on Information about Price

The results of the planned comparisons are in Table 6-4. In general, these evaluations exhibit patterns which are inconsistent with predictions. For evaluations based on information about warranty, it was predicted that the slope in the two-attribute context would be less steep than in the one-attribute context, being least steep at the most attractive levels of warranty. Although the slope was significantly less steep in the two-attribute context, the slope did not become less steep at attractive levels of warranty. For evaluations based on information about shelf space, it was predicted that there would be no difference in slope between the one- and two-attribute contexts. The slope was, however, significantly less steep in the two-attribute context.

For evaluations based on information about energy cost and price, it was predicted that evaluations in the two-attribute context would resemble an inverted U, with a positive slope at unattractive levels of the known attribute and a negative slope at attractive levels of the known attribute. This did not occur in either case. In fact, for evaluations based on price, a negative slope at attractive (low) prices occurred in the one-attribute context, but not in the two-attribute context, as would be expected if inferences were made in the one-attribute context, but not in the two-attribute context. Such an effect is consistent with the view that price is different from other attributes in its propensity to prompt inferences in the absence of a contextual manipulation of salience. What is surprising is that inferences (at least those based on a perceived negative correlation between the evaluative implications of price and the inferred attribute) appeared not to be made when there was a contextual manipulation of salience. Perhaps price prompts inferences about quality unless attention is diverted to another missing attribute, in this case, capacity.

The carpet cleaner product class provides a set of comparisons analagous to those for the refrigerator product class. Evaluations of the test descriptions which provide only information about area cleaned will be considered first. Area cleaned is perceived to be unrelated to versatility, positively correlated (in terms of evaluative implications) with tank capacity, and negatively correlated (in terms of evaluative implications) with weight and price. The predictions for each expected relationship are of course the same as for refrigerators.

Evaluations are plotted as a function of the attractiveness of area cleaned in Figure 6-7, and the results of the planned comparisons are in Table 6-5. In every case, evaluations in the two-attribute context have a less steep slope than evaluations in the one-attribute context. This difference in linear trend was significant in the two-attribute contexts in which versatility and price were predicted to be inferred, and marginally significant in the two-attribute contexts in which tank capacity and weight were predicted to be inferred. These differences are consistent with predictions except in the context in which tank capacity was predicted to be inferred. In that context, the difference was predicted to be nonsignificant. Also contrary to prediction, there was no significant difference in quadratic trend in the contexts in which versatility, weight, or price were predicted to be inferred, while there was a significant

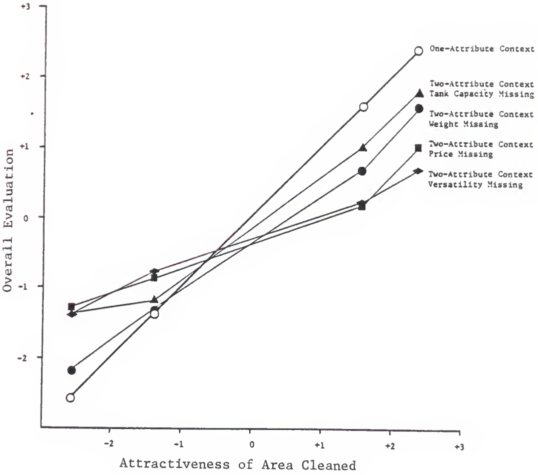

Figure 6-7
Carpet Cleaner Evaluations
Based on Information about Area Cleaned

Table 6-5
Context x Attractiveness of Known Attribute Interaction for Carpet Cleaners

Known Attribute	Missing Attribute (Two-Attribute Context)	Linear			Quadratic		
		Predicted	F	p	Predicted	F	p
Area cleaned	Versatility	yes	11.16*	.0049	yes	.01	.9106
Area cleaned	Tank capacity	no	3.19	.0959	no	4.86*	.0448
Area cleaned	Weight	yes	3.56	.0802	yes	.17	.6841
Area cleaned	Price	yes	6.38*	.0242	yes	1.15	.3020
Versatility	Area cleaned	yes	4.08	.0630	yes	2.21	.1590
Tank capacity	Area cleaned	no	2.31	.1505	no	4.24	.0587
Weight	Area cleaned	yes	11.68*	.0042	yes	.32	.5781
Price	Area cleaned	yes	.91	.3558	yes	1.17	.2969

*$p < .05$

difference in quadratic trend in the context in which tank capacity was predicted to be inferred.

Evaluations based on information about versatility, tank capacity, weight, and price are plotted as a function of the attractiveness of the known attribute in Figures 6-8 through 6-11, respectively, and the results of the planned comparisons are in Table 6-5. When these descriptions were encountered in the two-attribute context, it was predicted that inferences would be made about area cleaned. As predicted, evaluations based on information about versatility have a less steep slope in the two-attribute context than in the one-attribute context. This difference is marginally significant. Contrary to prediction, the slope becomes steeper for more attractive levels of versatility, although this difference in quadratic trend is not significant. As predicted, evaluations based on information about tank capacity have a similar slope in one- and two-attribute contexts, and the difference in linear trend is nonsignificant. Contrary to prediction, however, there is a marginally significant difference in quadratic trend, which is caused evaluations of the least attractive tank capacity in the two-attribute context being more favorable than evaluations of the second least attractive tank capacity.

As was the case for evaluations based on refrigerator price, evaluations based on weight and price both exhibit patterns that are consistent with what would be expected if inferences were made in the one-attribute context, but not in the two-attribute context. In both cases, evaluations for attractive levels of the known attribute have a negative slope in the one-attribute context, but not in the

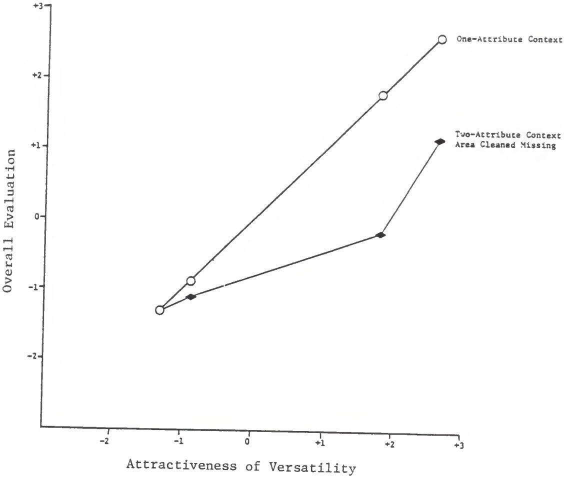

Figure 6-8
Carpet Cleaner Evaluations
Based on Information about Versatility

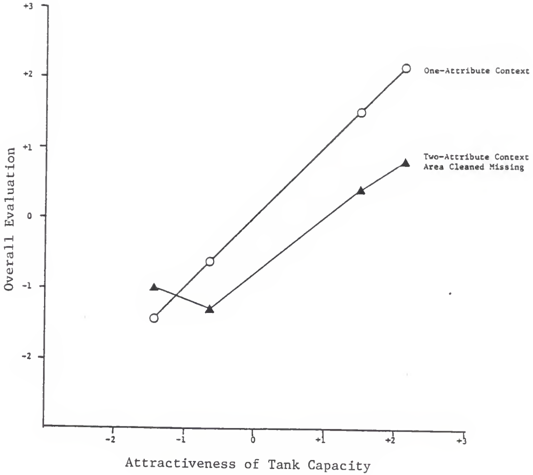

Figure 6-9
Carpet Cleaner Evaluations
Based on Information about Tank Capacity

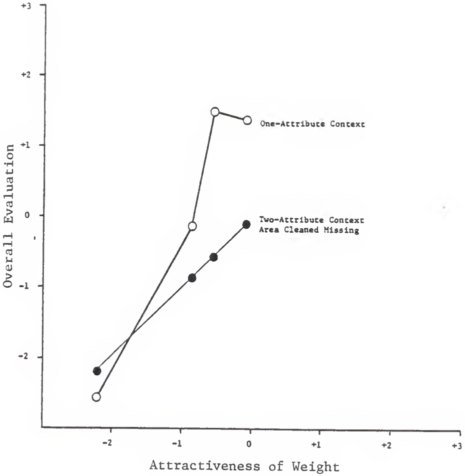

Figure 6-10
Carpet Cleaner Evaluations
Based on Information about Weight

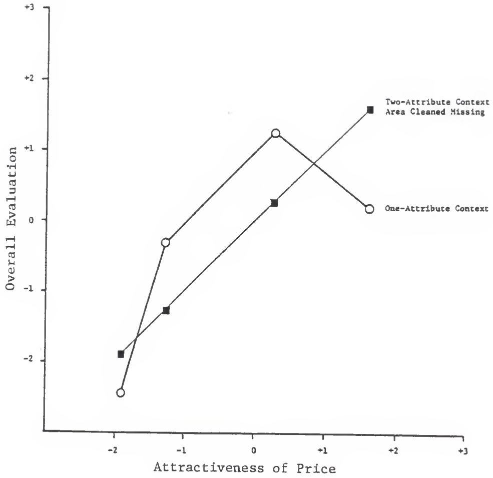

Figure 6-11
Carpet Cleaner Evaluations
Based on Information about Price

two-attribute context. These patterns suggest that the contextual manipulation of salience of the missing attribute, area cleaned, may divert attention away from another attribute which is inferred in the one-attribute context.

As a whole, analysis of the context x attractiveness of the known attribute interaction suggests that inferences are not being made as predicted. The systematic patterns in evaluations predicted by the inference model did not occur. This is most easily seen by a comparison of the predicted patterns in evalutions in Figure 6-1 with the observed patterns in evaluations based on information about refrigerator capacity in Figure 6-2 and on information about carpet cleaner area cleaned in Figure 6-7.

Replication and order effects. If the main effect of context or the context x attractiveness of the known attribute interaction were involved in interactions with other design factors, then the interpretation of these planned comparisons might be altered. To examine this possibility, an analysis of variance which included the design factors replications and order of presentation of the one-attribute context was conducted. This analysis is described in Appendix IV. It indicated no problems with the interpretation of the planned comparisons.

Summary. Although the planned comparisons suggest that inferences were not made as predicted, the information context manipulation does appear to influence evaluations. Evaluations in the two-attribute context tend to be less favorable than evaluations in the one-attribute context. In addition, there appears to be a tendency for the marginal value of the known attribute to be lower in the two-attribute context. In Figures 6-2 through 6-11, it can be seen that this tendency occurred in the majority of the comparisons between the one- and two-attribute contexts. Finally, it appears that the likelihood of making some kinds of inferences may actually be inhibited when a missing attribute is made salient by the information context. Evaluations based on information about refrigerator price, carpet cleaner weight, and carpet cleaner price all exhibited patterns consistent with inferences being made in the one-attribute context, but not in the two-attribute context.

Retrospective Comments

In this pilot study, retrospective comments were collected primarily to aid in developing a coding system for use in later studies. In light of the evaluation data which strongly suggest that inferences were not made as hypothesized, the retrospective comments became a valuable source of evidence about subjects' thought processes. Therefore, retrospective comments were coded for the incidence of mentioning an attribute not contained in the description and of making inferences about such attributes. If a subject explicitly stated an assumed value for a missing attribute, or stated the expected relationship between a known and missing attribute, the subject was coded as having made an inference. Each subject's retrospective comments were coded independently by two coders. Discrepancies were resolved by a third coder.

Two confounds prevent unambiguous interpretation of the retrospective comments data. First, the order in which retrospective comments were requested was not counterbalanced across information contexts. Subjects were always asked to provide retrospective comments for two test descriptions encountered in the two-attribute context first, and for a test description encountered in the one-attribute context second. To the extent that retrospective comments do not accurately represent the previous evaluation process, but reflect biases in recall or concurrent processing, order effects may be expected to occur.

The second confound involves the attractiveness of the known attribute. Inadvertently, the attractiveness of test descriptions for which retrospective comments were requested varied with information context and order. The first description for which retrospective comments were requested, which was from the two-attribute context, was always very attractive. The second description for which retrospective comments were requested, which was also from the two-attribute context, was always very unattractive. The third description, which was from the one-attribute context, varied randomly in its attractiveness from very unattractive to very attractive. To the extent that the attractiveness of the known attribute affects the processes of interest, then, these data may be misleading.

Unfortunately, the likely effects of these confounds are not clear. Because retrospective comments were requested for descriptions in the two-attribute context first, it may be argued that a processing strategy which involves thinking about missing attributes is likely to be carried over into the one-attribute context. Therefore the likelihood of mentioning and inferring missing attributes may be overestimated in the one-attribute context. On the other hand, it may also be argued that a fatigue effect makes it less likely that missing attributes will be mentioned and inferred for evaluations made in the one-attribute context. There is also no obvious prediction about the effects of the attractiveness of the known attribute. Therefore, the retrospective comments must be considered as only suggestive of the thought processes which occurred as the product evaluations were made.

It was predicted that missing attributes would be more likely to be salient in the two-attribute context, and that when a missing attribute was salient, it value would be likely to be inferred. Therefore, it was expected that the likelihood of mentioning missing attributes and the likelihood of making inferences about missing attributes would both be greater in the two-attribute context than in the one-attribute context.

Table 6-6 reports proportions of subjects who mentioned or made an inference about an attribute not contained in the description. Differences in proportions mentioning and inferring missing attributes were assessed via Cochran's $\underline{Q}$ statistic (McNemar, 1969), an extension of chi-square for more than two correlated proportions. Results are reported in Table 6-7. The omnibus test was significant for both dependent variables. For pairwise comparisons, an alpha level of .017 (.05/3) was adopted. The incidence of mentioning missing attributes was greater in two-attribute contexts, as predicted. (There was a significantly greater likelihood of mentioning a missing attribute for the first description from the two-attribute context [very attractive] than for the second description [very unattractive].) There was, however, no significant pairwise difference in the likelihood of making inferences between contexts.

These results suggest that the two-attribute context makes missing attributes salient, but has little effect on the overall

Table 6-6
Proportion of Subjects Mentioning or Inferring a Missing Attribute

	Context		
	Two-Attribute (1st)	Two-Attribute (2nd)	One-Attribute (3rd)
Mention	.70	.46	.25
Inference	.14	.06	.20

Note: 1st, 2nd, and 3rd refer to the order in which retrospective comments were elicited

Table 6-7
Cochran's *Q*
Differences in Proportions of Subjects Mentioning or Inferring a Missing Attribute

		Pairwise Comparisons		
	Overall	1st & 2nd	1st & 3rd	2nd & 3rd
Mention	32.98^a	10.31^b	28.17^b	7.81^b
Inference	6.74^a	1.79*	1.19*	5.26*

$^a p < .05$
$^b p < .017$
*includes Yates's correction for continuity

Note: 1st and 2nd descriptions are from the two-attribute context; 3rd description is from the one-attribute context.

incidence of inference making. This could occur for two reasons. First, inference making may be relatively unaffected by information context. The same inferences may be made in both contexts. Although additional attributes become salient in the two-attribute context, inferences may be made about them only rarely. The second possibility is that information context determines the attributes about which inferences are made, while the overall level of inference making remains the same, perhaps because of capacity limitations. The two-attribute context may thus divert attention away from attributes that are inferred in one-attribute contexts to attributes made salient by the two-attribute context.

Examination of the actual inferences made provides limited support for the second process. In the refrigerator product class, six subjects made inferences in the one-attribute context. All of these inferences were about quality. Two subjects inferred quality from warranty, and three inferred quality from price. In the two-attribute context, eight subjects made inferences. Only one inferred quality from price, and none inferred quality from warranty. Three inferred warranty from capacity, two inferred capacity from shelf space, and two inferred capacity from price. The two-attribute context appeared to divert attention away from quality and to the attribute made salient by the information context.

In the carpet cleaner product class, the pattern is less clear. Thirteen subjects made inferences in the one-attribute context. These included inferences about quality, price, economy, area cleaned, weight, and bulkiness. In the two-attribute context, ten subjects made inferences about a similar set of attributes. Since many of the attributes made salient in the two-attribute context (price, area cleaned, and weight) were inferred in the one-attribute context, there was limited opportunity for the two-attribute context to divert attention away from attributes considered in the one-attribute context. Therefore, the effects of the two-attribute context are unclear in this product class.

Recall the patterns in evaluations of descriptions which provided information about refrigerator price, carpet cleaner weight, and carpet cleaner price. In every case, patterns in evaluations were consistent with what would be expected if inferences based on a negative correlation between known and missing information were made in the one-attribute context, but not in the two-attribute context. If this is indeed what occurred, this would be further evidence that the two-attribute context diverts attention away from attributes considered in the one-attribute context. Retrospective comments indicate that this is what occurred for evaluations based on refrigerator price. It is less clear what occurred for evaluations based on weight and price in the carpet cleaner product class. The limited number of retrospective comments collected is a problem; there is clearly a need to collect more extensive verbalizations to obtain insight into the evaluation process.

Discussion

It was hypothesized that inferences are commonly made about salient missing attributes, and that the set of attributes for which information is typically available is a major determinant of the salience of missing attributes. If information is not typically available about an attribute, then it is unlikely to be salient, and its value is unlikely to be inferred when it is not known. If information is typically available about an attribute, then it is likely to be salient, and its value is likely to be inferred when it is not known. It was further hypothesized that inferred values are negatively biased and depend upon the expected relationship between known and missing attributes.

To test these hypotheses, a set of one-attribute test descriptions were evaluated in one of two information contexts. In one-attribute contexts, information was never available about other attributes. It was expected that missing attributes would be unlikely to be salient, and therefore that inferences about missing attributes would be unlikely to be made. As a result, evaluations of the test descriptions in one-attribute contexts were expected to be influenced only by the attractiveness of the known attribute. In two-attribute contexts, information was typically available about two attributes. It was expected that both attributes would be salient, and that when information was not provided about one of them, it value would be inferred. Therefore evaluations of the test descriptions in two-attribute contexts were expected to be influenced both by the attractiveness of the known attribute and the inferred attractiveness of the missing attribute.

It was predicted that evaluations in the two-attribute context, which are posited to include inferences, would be less favorable than inferences in the one-attribute context. This is due to the predicted negative bias in inferences. It was also predicted that evaluations in the two-attribute context would exhibit systematic differences in linear and quadratic trends when compared to evaluations in the one-attribute context. These differences depend upon the expected relationship between known and missing information.

Tests of Hypotheses

As predicted, retrospective comments indicated that information context is an important determinant of the salience of missing attributes. The proportion of subjects mentioning a missing attribute was much higher in the two-attribute context than in the one-attribute context.

Contrary to predictions, however, both retrospective comments and evaluation data suggested that inference making is not a common response to salient missing attributes. The proportion of subjects making inferences about salient missing attributes was no greater in the two-attribute context than in the one-attribute context, and patterns in evaluations were generally inconsistent with those predicted if inferences were made as hypothesized. While evaluations in the two-attribute context did tend to be less favorable than evaluations in the one-attribute context, the predicted systematic patterns in linear and quadratic trends did not occur.

Other Effects of Information Context

While hypotheses about inference making were generally not supported, it is clear that information context has potentially important effects on evaluations. Evaluations in the two-attribute context tended to be less favorable than evaluations in the one-attribute context. The impact of known attributes on overall evaluations tended to be lower in two-attribute contexts, as indicated by lower slopes when evaluations are plotted as a function of the attractiveness of the known attribute.

Such a pattern is consistent with what would occur if subjects in the two-attribute context always inferred that the missing attribute is somewhat below average in its evaluative implications. This type of inference process has been suggested by by Yamagishi and Hill (1982) and Meyer (1981). As the retrospective comments indicated that inferences were not commonly made, however, this explanation seems unlikely.

An alternative explanation is that noticing the absence of attribute information that is typically available captures cognitive capacity that would normally be given to elaborative processing of the known attribute. Attention focuses on the obviously missing attribute, and known attributes are processed less thoroughly than they otherwise would be. The result is that known attributes receive less weight when integrated with the initial impression, which accounts for the lower marginal value of known attributes. Some elaborative inferences that would otherwise be made are not made, as when quality inferences were less likely to be made about refrigerators in the two-attribute context. Less favorable evaluations in the two-attribute context may be accounted for either by assuming that the initial impression is somewhat negative, or by assuming that descriptions which are perceived to be incomplete are penalized. Given that the two-attribute context is so effective in drawing attention to the missing attribute, the second explanation perhaps is more plausible.

This possibility is particularly interesting because it suggests that perceiving a product description as incomplete may have effects other than just lowering the immediate evaluation of the product. If the known information receives less attention, it may be less likely to be encoded in long term memory. The implication is that failure to provide information which is provided by competitors may reduce the effectiveness of a marketing communication. Withholding negative information may hurt, rather than help, the chances that product information will be thoughtfully considered and retained.

Alternative Explanations for Low Incidence of Inferences

It is possible that inferences are a common response to salient missing attributes, but that methodological problems in this study discouraged the use of this common strategy. Possible explanations for the low incidence of inference making observed in this study are discussed below.

Response opportunity and motivation. Subjects may not have been sufficiently motivated to evaluate the products in a thoughtful manner. The inferences of interest are expected to be somewhat effortful. It is therefore important that the task engage the attention and interest of the subjects. The sheer number of evaluations required (56) may have discouraged thoughtful evaluations, and may have instead encouraged a problem solving strategy which maximized the ease and speed with which the evaluations could be made. Less thoughtful processing of incompletely described alternatives and lowering evaluations of such alternatives may be one such strategy. This response to missing information may occur under conditions of limited response motivation and opportunity, while inference making occurs under conditions more favorable for thoughtful product evaluations.

Attribute correlations inconsistent with expectations. Two-attribute descriptions were created by factorially combining attractiveness levels of the two attributes, introducing a zero correlation between the attributes. Observation of these sets of product descriptions may have discouraged subjects from using preconceived expectations about correlations between attributes to make inferences. If the set of products to be evaluated instead exhibited correlations between attributes which were consistent with expectations, subjects might infer the value of the missing attributes more readily.

Experiment II

Chapter VII describes a second experiment which was designed to eliminate methodological concerns about the validity of these data and to gain further insight into how consumers respond to missing information.

CHAPTER VII
EXPERIMENT II

Introduction

Experiment I indicated that inference making is not a common response to missing information. It is possible that inference making is actually a common response to missing information, but that methodological problems in Experiment I discouraged the use of this strategy. Experiment II was designed to eliminate two such potential problems: the possibility that the zero correlation between attributes in observed product sets discouraged inference making based on expected correlations between attributes, and the possibility that the large number of product evaluations to be made discouraged elaborative processing such as inference making.

Experiment II also addresses another methodological issue relevant to the interpretation of the data. Although the predicted inference processes did not occur in Experiment I, overall evaluations were clearly influenced by information context. Evaluations in the two-attribute context tended to be less favorable than evaluations in the one-attribute context, and the impact of known attributes on overall evaluations tended to be lower in the two-attribute context. It was suggested that these effects occurred because the two-attribute context focuses attention on the missing attribute and away from known product information. Because attention focuses on the missing attribute, the product description is perceived as incomplete. It is therefore evaluated less favorably. Because less attention is paid to known information, the known attribute has less impact on overall evaluations.

Experiment II assesses an alternative explanation: the possibility that information context effects are due to differences in the use of the response scale by subjects in different contexts, rather than to real differences in evaluations.

Correlations Between Attributes in Observed Product Sets

In Experiment I, two-attribute descriptions were constructed by factorially combining attractiveness levels of the two attributes. This procedure created product sets in which there was zero correlation between attributes. Subjects may have been discouraged from making inferences based on expected correlations between attributes because evidence from the product sets they observed suggested that there was no correlation between attributes. To examine this possibility, a manipulation of the correlation between attributes was introduced. Two product sets were constructed for each two-attribute information context: one in which attribute correlations were consistent with expectations, and one in which attribute correlations were inconsistent with expectations.

Number of Product Evaluations

In Experiment I, every subject made 56 separate product evaluations. The number of evaluations to be made may have discouraged elaborative processing such as inference making. To eliminate this concern, the number of evaluations was reduced from 56 to 20. This was accomplished primarily by eliminating the within subject replication, so that each subject evaluated each alternative only once.

In addition, the number of alternatives in the two-attribute context was reduced, and the number of alternatives in the one-attribute context was increased, making the number of evaluations in the two contexts more similar (eight and twelve, respectively). This change reduces the probability that differences in processing loads cause differences in the likelihood of inference making between contexts.

Response Function Effects

In Experiment I, there was a tendency for evaluations to be less favorable and for the impact of the known attribute on evaluations to be lower in the two-attribute context. It was suggested that these effects are due to a focusing of attention on the missing attribute in this context. An alternative explanation is that there are no differences in evaluations between contexts, but that the observed effects are due to differences in the use of the response scale by subjects in different contexts.

Parducci (1965) has presented evidence for a theory of category judgment which proposes that the meaning of the response scale is influenced by the context in which judgments are made; specifically, by the total set of stimuli which are evaluated. Category judgments are proposed to be a compromise between two principles: a range principle and a frequency principle.

According to the range principle, the judge anchors the ends of the response scale on the lowest evaluation and the highest evaluation in the set. The available response categories are then used to divide the range of evaluations in the set. When the range of evaluations is great, each response category encompasses a large evaluative range, with the result that large differences in evaluations are indicated by relatively small differences on the response scale. When the range of evaluations is small, each response category encompasses only a small range of evaluations, with the result that small differences in evaluations are indicated by relatively large differences on the response scale. Therefore, the apparent size of differences in evaluations is an inverse function of the range of evaluations in the stimulus set. A large range makes differences in evaluations appear smaller, and a small range makes differences in evaluations appear larger.

According to the frequency principle, the use of response categories is affected by the rank order of evaluations in the stimulus set. The judge is proposed to use each category for a fixed proportion of judgments. Evaluations that are lower than most other evaluations are placed in the lowest response categories, evaluations at the median are placed in the middle response categories, and evaluations that are higher than most others are placed in the highest response categories. How positively or negatively an alternative is rated is therefore determined in part by its evaluation's rank order in the set.

The differences in evaluations between one- and two-attribute contexts which were observed in Experiment I may reflect range or frequency effects rather than real differences in the way the products are evaluated. Lower ratings of the test descriptions in the two-attribute context could result from a frequency effect. If the rank orders of test description evaluations are lower in the two-atttribute context than in the one-attribute context, the frequency principle predicts that the test descriptions will be rated lower in the two-attribute context. This is predicted to occur even if there is no real difference in evaluations of test descriptions in the two contexts.

The lower impact of the known attribute on overall ratings in the two-attribute context could result from either a frequency effect or a range effect. If the rank orders of the evaluations of different attractiveness levels of the known attribute are closer together in the two-attribute context than in the one-attribute context, the frequency principle predicts that they will be rated closer together. Thus it will appear that varying the attractiveness of the known attribute has less impact on evaluations in the two-attribute context.

Alternatively, if the range of evaluations in the entire product set is greater in the two-attribute context than in the one-attribute context, the range principle predicts that different attractiveness levels of the known attribute will be rated closer together in the two-attribute context. Each response category will encompass a broader evaluative range, so that differences in ratings will tend to be smaller. Again, it will appear that varying the attractiveness of the known attribute has less impact on evaluations in the two-attribute context.

Thus, range and frequency effects are competing explanations for the observed effects of information context on evaluations. Before it may be concluded that the two-attribute information context focuses attention on the missing attribute, which in turn causes differences in the way product information is processed and evaluated, these competing explanations must be eliminated. In the current study, a combination of control procedures and diagnostic analyses are used to rule out the possibility of range and frequency effects.

It is theoretically possible to control for range effects by having judges in different contexts rate identical evaluatively extreme alternatives prior to the critical judgment tasks. If these additional alternatives are more extreme in their evaluative implications than any of the alternatives which will subsequently be evaluated, they will anchor the endpoints of the response scale for all judgments, insuring that the range of evaluations is identical across all information contexts. This is the procedure employed here.

It is theoretically possible to control for frequency effects by insuring that the rank order of the evaluations of test descriptions is identical in all information contexts. Because the product sets employed do not control for frequency effects in this manner, frequency effects are instead assessed by a models comparison procedure. A frequency-effects model of the rating process is constructed. This model assumes that all between context differences in ratings are entirely attributable to differences in the rank order of evaluations between contexts. The frequency-effects model is then compared with a model which assumes that there are real differences in evaluations between contexts which cannot be entirely accounted for by differences in rank orders. If there are real differences in evaluations, the second model should significantly improve prediction over the frequency-effects model.

Method

Subjects

Subjects were 320 undergraduate psychology and marketing students who participated for optional course credit.

Materials

Product descriptions. Several changes were made in the product descriptions from Experiment I. The number of product descriptions in two-attribute contexts was reduced from 24 (sixteen two-attribute descriptions and eight test descriptions) to 12 (eight two-attribute descriptions and four test descriptions). The number of descriptions in one-attribute contexts was increased from four (four test descriptions) to eight (four test descriptions and four other one-attribute descriptions). These changes helped reduce the total number of evaluations made, while making processing loads in the two contexts more similar.

In order to add four new one-attribute descriptions to the one-attribute context, four additional descriptions of each product attribute were created. They were created to be only slightly different in evaluative implications from the original four descriptions. This procedure insured that two-attribute alternatives described in terms of the new attribute descriptions would reflect approximately the same correlations as alternatives described in terms of the corresponding original attribute descriptions. The additional attribute descriptions are in Tables 7-1 and 7-2, and may be compared with the original descriptions which are in Tables 5-2 and 5-3.

To manipulate observed correlations between attributes, two sets of two-attribute product descriptions were created for each

Table 7-1
Additional Refrigerator Attribute Descriptions for Experiment II

Attribute	Attractive-ness*	Description
Warranty	--	3 months warranty
	-	5 months warranty
	+	19 months warranty
	++	25 months warranty
Shelf space	--	1 full shelf, 1/2 door shelf
	-	2 full shelves, 1/2 door shelf
	+	3 full shelves, 2 1/2 door shelves
	++	4 full shelves, 3 1/2 door shelves
Energy cost	--	$21/month average energy cost
	-	$13/month average energy cost
	+	$7/month average energy cost
	++	$3/month average energy cost
Price	--	$1610 price
	-	$1210 price
	+	$510 price
	++	$360 price
Capacity	--	4.5 cu. ft. refrigerator capacity
	-	6.5 cu. ft. refrigerator capacity
	+	18.5 cu. ft. refrigerator capacity
	++	25.5 cu. ft. refrigerator capacity

* -- very unattractive
- moderately unattractive
+ moderately attractive
++ very attractive

Table 7-2
Additional Carpet Cleaner Attribute Descriptions for Experiment II

Attribute	Attractive-ness*	Description
Versatility	--	suitable only for patio type carpets
	-	suitable only for short weave synthetic carpets
	+	suitable for most carpets and rugs
	++	suitable for all carpet types
Tank Capacity	--	extra small tank holds .4 gal. cleaning solution
	-	small tank holds .6 gal. cleaning solution
	+	medium tank holds 1.6 gal. cleaning solution
	++	large tank holds 2.1 gal. cleaning solution
Weight	--	weighs 49 lbs. when tank is full
	-	weighs 34 lbs. when tank is full
	+	weighs 19 lbs. when tank is full
	++	weighs 11 lbs. when tank is full
Price	--	$505 price
	-	$305 price
	+	$130 price
	++	$85 price
Area Cleaned	--	cleans .35 average size room/refill
	-	cleans .85 average size room/refill
	+	cleans 2.35 average size room/refill
	++	cleans 3.10 average size room/refill

* -- very unattractive
- moderately unatttractive
+ moderately attractive
++ very attractive

two-attribute context: one in which attribute correlations were consistent with expectations and one in which attribute correlations were inconsistent with expectations. Product sets for each information context and correlation condition are in Appendix V.

For contexts in which there was expected to be no correlation between attributes, consistent product sets were constructed so that there was a zero correlation between the attractiveness of the two attributes. Inconsistent product sets were constructed so that there was a high negative correlation between the attractiveness of the attributes. A negative correlation was chosen because a positive correlation would make it impossible to distinguish between an inference process based on observed correlations and one based on evaluative consistency.

For contexts in which there was a positive or negative expected correlation between the evaluative implications of attributes, consistent product sets were constructed so that there was a high positive or high negative correlation between the attractiveness of the two attributes, respectively. Inconsistent product sets were constructed to have a zero correlation between the attractiveness of the attributes.

Service descriptions. In order to establish common endpoints for the response scale across information contexts, subjects in each context rated a common set of four evaluatively extreme alternatives prior to rating the products. For refrigerators, these evaluatively extreme alternatives were refrigerator rental services, while for the carpet cleaner product class, they were carpet cleaning services.

The services were chosen for two reasons. First, the services may be described in terms of attributes different from those used to describe the products. As the purpose of the information context manipulation is to control the set of attributes subjects consider in making their evaluations, it is important that the new alternatives not make additional product attributes salient. Second, although the services may be described in terms of a different set of attributes, they fulfill the same needs as the corresponding products. Therefore it is a reasonable assumption that subjects are able to use the same psychological scale to evaluate both the products and the services.

Descriptions of the services were constructed so that one of the services in each product class was extremely unattractive, one was very unattractive, one was very attractive, and one was extremely attractive. Descriptions of the refrigerator rental services and the carpet cleaning services are in Tables 7-3 and 7-4, respectively.

Instruction and response booklets. Subjects were given instruction booklets which included a brief description of the research, an informed consent form, task instructions, and descriptions of the alternatives to be rated. Subjects entered their evaluations in response booklets. A sample instruction booklet is in Appendix II.

As in Experiment I, the task was presented as one of examining a catalog in anticipation of making a purchase. In the instruction booklet, product descriptions were presented together on a page as in a catalog, and were preceded by a general description of the products. Product descriptions were in the same random order for each subject. After examining this catalog page facsimile, subjects rated each

Table 7-3
Refrigerator Rental Services

Extremely Unattractive

$800 security deposit required
$30 minimum delivery charge
$30 minimum pickup charge (customers are required to use our delivery and pickup services)
rental fees are not applicable to purchases
4 months rent required in advance, not refundable for unused time

Very Unattractive

$400 security deposit required
2 months rent required in advance, not refundable
rental fees are not applicable to purchases
$20 minimum delivery charge
$20 minimum pickup charge (customers are required to use our delivery and pickup services)

Very Attractive

free delivery
free pickup
rent payable one month in advance - refundable for any unused time
no security deposit
70% of rental fees applicable to purchase of any refrigerator in stock

Extremely Attractive

free delivery and installation of refrigerator
free pickup of refrigerator when you are through renting
100% of rental fees may be applied toward purchase of any new or previously rented refrigerator
first month free - rent always refundable for unused time
no deposit required

Table 7-4
Carpet Cleaning Services

Extremely Unattractive

moving furniture is customer's responsibility
advance payment required - not refundable for any reason
not responsible for damages to carpet or furniture
carpet requires 5 days to dry
customers should plan to leave house for 48 hours due to fumes from cleaning fluid

Very Unattractive

carpets require 3 days to dry
not responsible for any damage to carpet or furniture
customer is responsible for moving furniture
advace payment required - not refunable for any reason
customers should plan to leave house for 24 hours due to fumes from cleaning fluid

Very Attractive

carpets ready for use in 3 hours
fully insured - we pay for any damages
no odor, no mess
satisfaction guaranteed or no charge for services
we carefully move your furniture and replace it when finished

Extremely Attractive

pay only if completely satisfied after job completion
we move your furniture and return it to original location
carpets ready for use in 1 hour
fully insured - we pay for any damages even if not our fault
no odor or fumes

---

product in the response booklet. In this booklet, product descriptions were presented for rating, each on a separate page, in a different random order for each subject.

Services for a given product class were presented together on a page in the instruction booklet. They were in the same random order for all subjects. In the response booklet, they were presented to be rated together on a page in the same random order.

Design

With the exception of the changes which are described below, the design was identical to that of Experiment I.

Correlations between attributes. A between-subjects manipulation of the correlation between attributes in two-attribute contexts was introduced. As described above under Materials, product sets were constructed so that attribute correlations were either consistent or inconsistent with expectations about attribute relationships.

No within-subjects replication of evaluations. To reduce processing loads and thus facilitate elaborative processing such as inference making, each subject evaluated each product only once.

Test descriptions in two-attribute contexts. In Experiment I, subjects in two-attribute contexts evaluated a set of four test descriptions for each of the two attributes in the context. To help reduce processing loads, subjects in two-attribute contexts in Experiment II evaluated only one set of four test descriptions. For example, in Experiment I, a subject in the context in which information was typically available about refrigerator capacity and warranty evaluated four test descriptions which only provided information about warranty, and four test descriptions which only provided information about capacity. In Experiment II, a subject in this context evaluated either four test descriptions which only provided information about warranty or four test descriptions which only provided information about capacity, but not both.

Services evaluations. Subjects rated the services twice: once before and once following the product rating task.

Dependent Variables

Product evaluations. Product descriptions were rated on an 11-point scale from -5 (very unattractive) to +5 (very attractive).

Retrospective comments. After completing the product evaluation task, subjects were asked to recall the thought processes involved in evaluating the least attractive and the most attractive test description in the context.

Service evaluations. Services were rated on an 11-point scale from -5 (very unattractive) to +5 (very attractive).

Procedure

Subjects were administered the task in groups of varying sizes. Most of the subjects participated during a special class session in which they had an opportunity to respond to a number of questionnaires. The experimenter gave general instructions about working carefully.

Results

Response Function Effects on Evaluations

Range effects. According to the range principle, the apparent size of differences in evaluations is an inverse function of the range of evaluations in the stimulus set. The finding from

Experiment I that the known attribute tended to have less impact on overall evaluations in the two-attribute context could have been caused by a range effect. If the range of evaluations is greater in the two-attribute context than in the one-attribute context, the range principle predicts that different attractiveness levels of the known attribute will be rated closer together in the two-attribute context. Thus it will appear that varying the attractiveness of the known attribute has less impact on evaluations in the two-attribute context, even if the influence of the known attribute is actually the same in the two contexts.

To control for range effects, subjects in all information contexts rated identical evaluatively extreme services prior to rating the products. The services were refrigerator rental services for the refrigerator product class and carpet cleaning services for the carpet cleaner product class. If these services were more evaluatively extreme than any of the products, and if subjects were able to use the same response scale to evaluate both the services and the products, the services should have anchored the endpoints of the response scale for all judgments. This would insure that the range of evaluations was identical in all contexts, thus eliminating range effects as an explanation for differences in ratings between contexts.

Two types of evidence are needed to determine if the services were successful in anchoring the response scale for all judgments. First, ratings of the services must be more evaluatively extreme than ratings of any of the products. Second, subjects' ratings of the services must not change during the course of the product evaluation task. Such a change would indicate that the response scale did not remain stable over time, and thus that the same response scale was not used to make all judgments.

Table 7-5 contains mean ratings for the least attractive service and product and the most attractive service and product in each refrigerator information context. Table 7-6 contains the same information for carpet cleaners. Services were generally rated as more evaluatively extreme than the products. For each product class, there are only three out of twenty-one contexts in which this is not true.

To determine if the response scale remained stable over time, an analysis of variance with information context (one-attribute, two-attribute consistent, and two-attribute inconsistent) and order (one-attribute context first or two-attribute context first) as between subjects factors and services (extremely unattractive, very unattractive, very attractive, and extremely attractive) and time (before and after product rating task) as within subjects factors was conducted for each known and missing attribute combination. This analysis is described in detail in Appendix V, and will only be summarized here. The effects of interest are described below:

(1) Main Effect of Time: A significant main effect of time would indicate that, on the average, ratings of the services did change over time, and thus that the services were not successful in anchoring the response scale.

(2) Time x Service Interaction: A significant time x service interaction would indicate that there were changes in the way at least one of the services was rated over time, and thus that the services were not completely successful in anchoring the response scale.

Table 7-5
Mean Ratings for Least Attractive and Most Attractive Refrigerator and Refrigerator Rental Service

Known Attribute	Missing Attribute (Two-Attribute Context)	Correlation Between Attributes	Least Attract. Service	Least Attract. Product	Most Attract. Product	Most Attract. Service
Capacity	-	-	-4.44	-1.75	2.72	4.66
Capacity	Warranty	Consistent	-3.00	-2.80	4.00	3.60*
Capacity	Warranty	Inconsistent	-4.00	-3.20	2.60	4.00
Capacity	Sh. space	Consistent	-4.90	-3.10	4.10	5.00
Capacity	Sh. space	Inconsistent	-4.80	-2.80	3.80	5.00
Capacity	En. cost	Consistent	-3.30	-2.10	1.60	3.60
Capacity	En. cost	Inconsistent	-4.70	-3.70	4.10	4.80
Capacity	Price	Consistent	-4.80	-1.60	2.10	4.90
Capacity	Price	Inconsistent	-4.60	-4.60	4.80	4.80*
Warranty	-	-	-4.16	-2.94	4.13	4.31
Warranty	Capacity	Consistent	-4.30	-3.10	3.60	4.80
Warranty	Capacity	Inconsistent	-4.30	-2.40	2.40	4.60
Sh. space	-	-	-4.75	-3.63	3.94	4.72
Sh. space	Capacity	Consistent	-3.80	-3.50	4.20	4.00*
Sh. space	Capacity	Inconsistent	-4.50	-3.20	3.30	4.60
En. cost	-	-	-3.94	-2.87	3.25	4.16
En. cost	Capacity	Consistent	-4.90	-1.70	2.70	4.60
En. cost	Capacity	Inconsistent	-3.90	-3.70	3.60	4.90
Price	-	-	-4.19	-2.81	2.44	4.28
Price	Capacity	Consistent	-4.20	-1.60	2.50	4.70
Price	Capacity	Inconsistent	-4.00	-3.50	3.40	4.70

*Contexts in which a service is not as evaluatively extreme as one of the products

Table 7-6
Mean Ratings for Least Attractive and Most Attractive Carpet Cleaner and Carpet Cleaning Service

Known Attribute	Missing Attribute (Two-Attribute Context)	Correlation Between Attributes	Least Attract. Service	Least Attract. Product	Most Attract. Product	Most Attract. Service
Area cl.	-	-	-4.66	-4.13	4.20	4.59
Area cl.	Vers.	Consistent	-4.60	-2.20	4.40	4.80
Area cl.	Vers.	Inconsistent	-4.40	-1.40	2.70	4.40
Area cl.	Tank cap.	Consistent	-4.70	-2.60	3.20	4.70
Area cl.	Tank cap.	Inconsistent	-5.00	-2.70	3.40	4.90
Area cl.	Weight	Consistent	-3.80	-3.40	2.50	3.90
Area cl.	Weight	Inconsistent	-4.70	-2.60	3.50	4.30
Area cl.	Price	Consistent	-3.70	-1.30	1.70	3.00
Area cl.	Price	Inconsistent	-4.60	-2.40	3.80	3.70*
Vers.	-	-	-3.81	-2.22	4.56	4.34*
Vers.	Area cl.	Consistent	-4.50	-2.40	3.60	4.50
Vers.	Area cl.	Inconsistent	-3.90	-1.80	3.40	4.00
Tank cap.	-	-	-4.66	-3.25	2.66	4.31
Tank cap.	Area cl.	Consistent	-4.90	-3.00	2.70	4.80
Tank cap.	Area cl.	Inconsistent	-3.30	-1.60	2.60	3.00
Weight	-	-	-4.66	-3.25	2.84	4.69
Weight	Area cl.	Consistent	-4.80	-3.60	1.50	3.90
Weight	Area cl.	Inconsistent	-4.50	-3.30	3.70	4.70
Price	-	-	-4.84	-3.34	2.41	4.56
Price	Area cl.	Consistent	-4.60	-2.90	1.80	4.80
Price	Area cl.	Inconsistent	-3.90	-4.40	3.70	4.20*

*Contexts in which a service is not as evaluatively extreme as one of the products

(3) Time x Context Interaction: A significant time x context interaction would indicate that, on the average, there were changes in the way the services were evaluated over time in at least one of the information contexts, and thus that the services were not successful in providing common anchors for the response scale for all information contexts.

(4) Time x Context x Service Interaction: A significant time x context x service interaction would indicate that there were changes in the way at least one of the services was evaluated over time in at least one of the information contexts, and thus that the services were not completely successful in providing common anchors for the response scale for all information contexts.

If the services were successful in providing common endpoints for the response scale for all judgments, all of the above effects should be nonsignificant. Significance tests for these effects are summarized in Tables 7-7 and 7-8 for refrigerators and carpet cleaners, respectively. Because it was desirable to establish the absence of these effects, an alpha level of .10 was adopted. Summary tables and details of the analysis, including followup tests, are in Appendix V.

The refrigerator rental services were quite effective in anchoring the response scale for refrigerator evaluations; only one of the effects of interest was significant. The carpet cleaning services were much less successful in anchoring the response scale for carpet cleaner evaluations. There are a number of significant effects which indicate that the response scale did not remain stable over time. Followup tests, however, indicated that there are actually few

Table 7-7
Range Effects Analysis
Refrigerator Rental Service Evaluations

Known Attribute	Missing Attribute (Two-Attribute Context)	Time		Time x Att.		Time x Context		Time x Att. x Context	
		F	p	F	p	F	p	F	p
Capacity	Warranty	1.37	.2476	1.76	.1563	.62	.5449	1.63	.1434
Capacity	Sh. space	.22	.6393	.09	.9586	1.39	.2595	.63	.7030
Capacity	En. cost	0.00	1.0000	.05	.9779	.51	.6014	1.98*	.0723
Capacity	Price	.71	.4051	.21	.8899	.02	.9786	.37	.8980
Warranty	Capacity	0.00	.9479	.27	.8495	.33	.7176	1.14	.3419
Sh. space	Capacity	1.56	.2178	1.28	.2841	.64	.5336	1.28	.2709
En. cost	Capacity	.53	.4709	.16	.9198	.64	.5307	1.41	.2162
Price	Capacity	.38	.5422	.23	.8775	1.78	.1805	.25	.9584

*p < .10

Table 7-8
Range Effects Analysis
Carpet Cleaning Service Evaluations

Known Attribute	Missing Attribute (Two-Attribute Context)	Time		Time x Att.		Time x Context		Time x Att. x Context	
		F	p	F	p	F	p	F	p
Area cl.	Vers.	.42	.5217	2.44*	.0656	.39	.6808	.22	.9706
Area cl.	Tank cap.	1.49	.2287	.54	.6619	.01	.9938	1.56	.1621
Area cl.	Weight	1.16	.2867	.91	.4401	.24	.7859	1.83*	.0970
Area cl.	Price	.28	.5971	2.42*	.0676	.35	.7070	3.52*	.0029
Vers.	Area cl.	1.90	.1752	4.63*	.0042	2.24	.1184	.45	.8438
Tank cap.	Area cl.	0.01	.9391	1.04	.3799	.09	.9113	1.06	.3884
Weight	Area cl.	1.56	.2175	2.13*	.0972	.70	.5024	2.35*	.0345
Price	Area cl.	1.03	.3155	1.01	.3927	3.64*	.0342	1.04	.4033

*p < .10

significant changes in the ratings of services over time. While the response scale was not entirely stable, there was little evidence of systematic changes such as would be expected if range effects were responsible for differences in ratings between contexts. It may therefore be concluded that the services rating task was quite effective in controlling for range effects in the refrigerator product class, and at least moderately effective in controlling for range effects in the carpet cleaner product class.

Frequency effects. According to the frequency principle, an alternative's rating is a function of its rank order in the set. The finding from Experiment I that ratings are less favorable in the two-attribute context and that the impact of the known attribute on overall ratings is lower in the two-attribute context could have been caused by frequency effects. If the rank orders of the test descriptions are lower in the two-attribute context, the frequency principle predicts that their ratings will be less favorable in the two-attribute context. If the rank orders of the test descriptions are closer together in the two-attribute context, the frequency principle predicts that they will be rated closer together, making it appear that varying the attractiveness of the known attribute has less impact on evaluations in that context. These effects are predicted to occur even if there are no real differences in evaluations between contexts.

A models comparison procedure was used to examine the possibility that frequency effects caused differences in ratings between contexts in the current study. If all differences in ratings between contexts can be accounted for by differences in rank orders of alternatives, then frequency effects cannot be eliminated as an explanation of the underlying process. If, however, there are differences between contexts which cannot be entirely accounted for by differences in rank orders, some other process must be at least partially responsible for the differences.

Three sets of models comparison tests were conducted. First, the ability of a frequency-effects model to account for differences between contexts was examined. Two models of the evaluation process were constructed for this comparison. The first model, a no-context-effects model, assumes that there are no differences in ratings between contexts. Ratings are assumed to be influenced only by the attractiveness level of the known attribute, and not by the context in which judgments are made. The second model, a frequency-effects model, assumes that there are differences in ratings between contexts, and that these differences are due entirely to differences in rank orders of alternatives in different contexts.

If the frequency-effects model significantly improves prediction over the no-context-effects model, then frequency effects may be occurring. These model comparison tests are summarized in Tables 7-9 and 7-10 for refrigerators and carpet cleaners, respectively. The frequency-effects model significantly improved prediction in 10 of the 16 cases tested, suggesting that frequency effects may be at least partially responsible for differences in ratings between contexts.

Next, the possibility that there is a main effect of context not caused by differences in rank orders was examined. A frequency-plus-context model was constructed by adding information context (one-attribute, two-attribute consistent, and two-attribute inconsistent)

Table 7-9
No-Context-Effects Model versus Frequency-Effects Model
Refrigerator Evaluations

Known Attribute	Missing Attribute (Two-Attribute Context)	Residual Sum of Squares No-Context-Effects	Freq.-Effects	Diff.	MS Diff.	MS Error	*F*	*p*
Capacity	Warranty	1582.65	1354.87	227.79	227.79	6.67	34.13*	.0001
Capacity	Sh. space	1291.58	1229.09	62.48	62.48	6.06	10.32*	.0015
Capacity	En. cost	1263.73	1242.04	21.69	21.69	6.12	3.55	.0611
Capacity	Price	1320.17	1320.05	.12	.12	6.50	.02	.8915
Warranty	Capacity	924.83	850.18	74.65	74.65	4.19	17.82*	.0001
Sh. space	Capacity	521.50	515.02	6.48	6.48	2.54	2.55	.1116
En. cost	Capacity	1322.06	1308.96	13.10	13.10	6.45	2.03	.1556
Price	Capacity	1217.35	1161.86	55.49	55.49	5.72	9.69*	.0021

df Difference = 1
df Error = 203

$^*p < .05$

Table 7-10
No-Context-Effects Model versus Frequency-Effects Model
Carpet Cleaner Evaluations

		Residual Sum of Squares						
Known Attribute	Missing Attribute (Two-Attribute Context)	No-Context-Effects	Freq.-Effects	Diff.	MS Diff.	MS Error	_F_	_p_
Area cl.	Vers.	720.42	696.51	23.91	23.91	3.43	6.97*	.0089
Area cl.	Tank cap.	645.56	640.00	5.55	5.55	3.15	1.76	.1859
Area cl.	Weight	652.19	639.50	12.69	12.69	3.15	4.03*	.0460
Area cl.	Price	792.02	786.57	5.44	5.44	3.88	1.41	.2373
Vers.	Area cl.	568.58	555.44	13.14	13.14	2.74	4.80*	.0295
Tank cap.	Area cl.	888.37	773.31	115.06	115.06	3.81	30.20*	.0001
Weight	Area cl.	1177.58	1127.87	49.71	49.71	5.56	8.95*	.0031
Price	Area cl.	1412.87	1255.81	157.06	157.06	6.19	25.39*	.0001

_df_ Difference = 1
_df_ Error = 203

$^*p < .05$

to the frequency-effects model. If the frequency-plus-context model significantly improves prediction over the frequency-effects model, then there is a main effect of context which is not accounted for by frequency effects. It may then be concluded that there is a real difference in evaluations induced by the information context manipulation.

These models comparison tests are summarized in Tables 7-11 and 7-12 for refrigerators and carpet cleaners, respectively. The frequency-plus-context model significantly improved prediction in six of the sixteen comparisons, and the improvement was marginally significant in two other comparisons. Of these eight comparisons, five were comparisons for which the frequency-effects model did not significantly improve prediction over the no-context-effects model.

These results provide strong evidence that there is a real difference in evaluations between information contexts. The frequency-plus-context model, however, assumes that the only real difference in evaluation between contexts is a main effect. In Experiment I, there was also a context x attractiveness of the known attribute interaction. It is this interaction which suggests that the impact of the known attribute on overall evaluations is lower in the two-attribute context. In order to determine if this interaction reflects real differences in the evaluation process, a final set of models comparisons tests were conducted.

A frequency-plus-context-plus-context x attractiveness model was constructed. This model assumes there is a context x attractiveness of the known attribute interaction which is not entirely accounted for by frequency effects. To construct this model, the context x

Table 7-11
Frequency-Effects Model versus Frequency-plus-Context Model
Refrigerator Evaluations

Known Attribute	Missing Attribute (Two-Attribute Context)	Residual Sum of Squares						
		Freq.-Effects	Freq.-plus-Context	Diff.	MS Diff.	MS Error	*F*	*p*
Capacity	Warranty	1354.87	1325.44	29.43	14.71	6.59	2.23	.1100
Capacity	Sh. space	1229.09	1181.59	47.50	23.75	5.88	4.04*	.0190
Capacity	En. cost	1242.04	1207.93	34.11	17.05	6.01	2.84	.0609
Capacity	Price	1320.05	1314.98	5.07	2.53	6.54	.39	.6794
Warranty	Capacity	850.18	817.52	32.66	16.33	4.07	4.02*	.0195
Sh. space	Capacity	515.02	508.67	6.36	3.18	2.53	1.26	.2871
En. cost	Capacity	1308.96	1265.19	43.76	21.88	6.29	3.48*	.0328
Price	Capacity	1161.86	1142.10	19.76	9.88	5.68	1.74	.1784

df Difference = 2
df Error = 201

*p < .05

Table 7-12
Frequency-Effects Model versus Frequency-plus-Context Model
Carpet Cleaner Evaluations

		Residual Sum of Squares						
Known Attribute	Missing Attribute (Two-Attribute Context)	Freq.-Effects	Freq.-plus-Context	Diff.	MS Diff.	MS Error	*F*	*p*
Area cl.	Vers.	696.51	676.11	20.40	10.20	3.36	3.03	.0504
Area cl.	Tank cap.	640.00	622.52	17.49	8.75	3.10	2.82	.0618
Area cl.	Weight	639.50	633.99	5.51	2.76	3.15	.87	.4190
Area cl.	Price	786.57	740.00	46.57	23.29	3.68	6.33*	.0022
Vers.	Area cl.	555.44	551.04	4.39	2.20	2.74	.80	.4503
Tank cap.	Area cl.	773.31	764.48	8.83	4.41	3.80	1.16	.3154
Weight	Area cl.	1127.87	1105.58	22.29	11.15	5.50	2.03*	.1345
Price	Area cl.	1255.81	1228.76	27.05	13.53	6.11	2.12*	.1121

df Difference = 2
df Error = 201

*$p < .05$

attractiveness of the known attribute interaction was added to the frequency-plus-context model.

If the frequency-plus-context-plus-context x attractivenss model significantly improves prediction over the frequency-plus-context model, then it may be concluded that there is a context x attractiveness of the known attribute interaction which is not caused by frequency effects. These models comparison tests are summarized in Tables 7-13 and 7-14 for refrigerators and carpet cleaners, respectively. Prediction was significantly improved in four of the sixteen cases, and marginally significantly improved in two others. As the context x attractiveness of the known attribute interaction is partially confounded with the rank order predictors of the frequency-effects model, these results may be taken as moderately strong evidence that there is a context x attractiveness interaction which is not caused by frequency effects. It appears likely that there is a real difference between contexts in the impact of the known attribute on overall evaluations.

Together, these models comparisons tests indicate that although frequency effects may account for some differences in ratings between information contexts, there is a main effect of context and a context x attractiveness of the known attribute interaction which cannot be accounted for by frequency effects. Although frequency effects may be occurring, they are not an adequate explanation of the process by which these judgments are made.

Summary. A considerable portion of differences in ratings between information contexts may be assumed to be real differences in the way products are evaluated, and not just differences in the use of

Table 7-13
Frequency-plus-Context Model versus Frequency-plus-Context-plus-Context x Attractiveness Model
Refrigerator Evaluations

		Residual Sum of Squares						
Known Attribute	Missing Attribute (Two-Attribute Context)	Freq.-plus-Context	Freq.-plus-Context-plus-Con. x Att.	Diff.	MS Diff.	MS Error	*F*	*p*
Capacity	Warranty	1325.44	1320.69	4.75	.95	6.74	.14	.9803
Capacity	Sh. space	1181.59	1158.09	23.50	4.70	5.91	.80	.5560
Capacity	En. cost	1207.93	1190.69	17.23	3.45	6.07	.57	.7274
Capacity	Price	1314.98	1294.99	19.99	4.00	6.61	.61	.6986
Warranty	Capacity	817.52	776.04	41.48	8.30	3.96	2.10	.0669
Sh. space	Capacity	508.67	481.67	27.00	5.40	2.46	2.20	.0556
En. cost	Capacity	1265.19	1244.32	20.88	4.18	6.35	.66	.6585
Price	Capacity	1142.10	1116.78	25.32	5.06	5.70	.89	.4910

df Difference = 5
df Error = 196

*$p < .05$

Table 7-14
Frequency-plus-Context Model versus Frequency-plus-Context-plus-Context x Attractiveness Model
Carpet Cleaner Evaluations

		Residual Sum of Squares						
Known Attribute	Missing Attribute (Two-Attribute Context)	Freq.-plus-Context	Freq.-plus-Context-plus-Con. x Att.	Diff.	MS Diff.	MS Error	*F*	*p*
Area cl.	Vers.	676.11	554.69	121.42	24.28	2.83	8.58*	.0001
Area cl.	Tank cap.	622.52	557.79	64.72	12.95	2.84	4.55*	.0007
Area cl.	Weight	633.99	578.69	55.29	11.06	2.95	3.75*	.0030
Area cl.	Price	740.00	654.99	85.01	17.00	3.34	5.09*	.0002
Vers.	Area cl.	551.04	543.46	7.58	1.52	2.77	.55	.7430
Tank cap.	Area cl.	764.48	740.84	23.64	4.73	3.78	1.25	.2864
Weight	Area cl.	1105.58	1068.64	36.93	7.39	5.45	1.35	.2422
Price	Area cl.	1228.76	1191.61	37.15	7.43	6.08	1.22	.2996

df Difference = 5
df Error = 196

*$p < .05$

the response scale in different information contexts. The range effects analysis provides evidence of considerable similarity of range of evaluations in different information contexts, and the frequency effects analysis suggests that frequency effects are not adequate to account for observed differences.

Correlations Between Attributes in Observed Product Sets

To examine the possibility that the zero correlation between attributes in two-attribute contexts in Experiment I discouraged inference making based on expected relationships, the correlation between attributes in two-attribute contexts was manipulated. Two product sets were constructed for each two-attribute information context: one in which attribute correlations were consistent with expectations, and one in which attribute correlations were inconsistent with expectations. Both product evaluations and retrospective comments may be examined for evidence that correlations between attributes in observed product sets affected the evaluation process.

Product evaluations. Interest focuses on evaluations of the test descriptions. Recall that when comparing one- and two-attribute contexts, the effects of interest are the main effect of context and the context x attractiveness of the known attribute interaction. It is predicted that evaluations in the two-attribute context will be lower than evaluations in the one-attribute context. This is because of the posited negative bias in inferences, which are predicted to be made only in the two-attribute context. It is also predicted that evaluations in the two-attribute context will exhibit systematic differences in linear and quadratic trend when compared with evaluations in the one-attribute context. These differences result from inferences which are expected to be averaged into overall evaluations in the two-attribute context.

An analogous set of comparisons is of interest here. If the factorial manipulation of attribute combinations in Experiment I was responsible for the low incidence of inference making, it would be predicted that such inferences would be made in the context in which attribute correlations are consistent with expectations, but not in the context in which attribute correlations are inconsistent with expectations.

For most contexts, this prediction holds even if subjects do not make inferences based on expected correlations at all, but instead make inferences based entirely on observed correlations. This is because for most known and missing attribute combinations there is zero correlation between attributes in inconsistent product sets and a high positive or negative correlation between attributes in consistent product sets. The exception is when there is expected to be no relationship between known and missing attributes. In this case, if inferences depend only on observed correlations, it would be expected that inferences would be made only in inconsistent contexts and not in consistent contexts.

If evaluations in the inconsistent context are completely uninfluenced by the missing attribute and thus made in the same manner as in the one-attribute context, it would therefore be predicted that evaluations in the consistent context would be less favorable than in the inconsistent context, and would also exhibit systematic patterns in linear and quadratic trends which reflect the inferences which are made only in that context.

From Experiment I, however, we know that there was a tendency for evaluations in the two-attribute context (in which attribute correlations were generally inconsistent with expectations) to be less favorable than evaluations in the one-attribute context. Therefore, even if inferences about missing attributes are made only in the consistent context, it is unclear whether evaluations in this context will be less favorable than in the inconsistent context. Certainly, if such an effect were to occur, it would be evidence that observed correlations between attributes influence processing strategy. If such an effect were not to occur, however, it would not mean that observed correlations do not influence processing strategy. Evaluations may be low in the inconsistent context because the alternative is penalized for being incompletely described, while evaluations in the consistent context may be similarly low because negatively biased inferences are made about the missing attribute.

Also from Experiment I, we know that there was a tendency for the impact of the known attribute on overall evaluations to be lower in the two-attribute context than in the one-attribute context. If such an effect also occurs here in the inconsistent contexts, it becomes unclear exactly what differences in trend are predicted between inconsistent and consistent contexts, even if inferences are only made in the consistent context. It would be expected, however, that some differences would occur. This is because the nature of the inference process is expected to vary depending on the expected relationship between known and missing attributes, while the process which is occuring in the inconsistent context is not expected to vary in such a systematic fashion.

Therefore, if the extent to which observed correlations between attributes are consistent with expectations influences the way in which product descriptions are evaluated, it is expected that such effects will be captured by the main effect of context and the context x attractiveness of the known attribute interaction, although no exact predictions about the nature of these effects can be made.

Significance tests for these effects are summarized in Tables 7-15 and 7-16 for refrigerators and carpet cleaners, respectively. Because it was desirable to establish the absence of these effects, an alpha level of .10 was adopted. Detailed summary tables for these analyses are in Appendix V. The main effect of context was significant for only two of the sixteen comparisons. When carpet cleaner tank capacity was known and area cleaned was the missing attribute, evaluations were significantly lower in the consistent context. When carpet cleaner price was known and area cleaned was the missing attribute, evaluations were significantly higher in the consistent context. This is approximately the number of significant differences which would be expected to occur by chance, given an alpha of .10. Given that only two significant differences were found and that these differences were in opposite directions from one another, it does not appear that the extent to which observed correlations between attributes were consistent with expectations had a systematic effect on the average favorability of evaluations.

It is the context x attractiveness of the known attribute interaction, however, which is clearly predicted to be significant if

Table 7-15
Consistency Effects
Refrigerator Evaluations

Known Attribute	Missing Attribute (Two-Attribute Context)	Means		Context		Context x Attractive.	
		Consistent	Inconsistent	F	p	F	p
Capacity	Warranty	-1.58	-1.65	.01	.9257	.08	.9709
Capacity	Sh. space	-.78	-1.05	.20	.6573	1.46	.2372
Capacity	En. cost	-.53	-.10	.37	.5520	.93	.4314
Capacity	Price	.33	.33	0.00	1.0000	1.65	.1903
Warranty	Capacity	-.88	-.45	.45	.5120	1.55	.2143
Sh. space	Capacity	-.58	-.35	.45	.5113	.53	.6632
En. cost	Capacity	.18	-.63	1.15	.3001	3.37*	.0259
Price	Capacity	-.70	-.48	.18	.6753	.33	.8045

*p < .10

Table 7-16
Consistency Effects
Carpet Cleaner Evaluations

Known Attribute	Missing Attribute (Two-Attribute Context)	Means		Context		Context x Attractive.	
		Consistent	Inconsistent	F	p	F	p
Area cl.	Vers.	.78	.85	.01	.9219	2.20	.1003
Area cl.	Tank cap.	.58	.13	.84	.3741	.23	.8747
Area cl.	Weight	-.40	.03	.32	.5793	.96	.4212
Area cl.	Price	.25	.80	.47	.5012	1.70	.1803
Vers.	Area cl.	.48	.73	.40	.5372	.32	.8090
Tank cap.	Area cl.	-1.45	-.50	3.41*	.0834	1.16	.3335
Weight	Area cl.	-.95	-.98	0.00	.9767	1.44	.2430
Price	Area cl.	-1.08	-2.33	3.29*	.0885	1.14	.3426

*p < .10

observed correlations between attributes influenced whether inferences were made about missing attributes. This interaction was significant for only one of the sixteen comparisons, when refrigerator energy cost was known and capacity was the missing attribute. Therefore, it does not appear that the extent to which observed correlations were consistent with expectations influenced evaluations.

If the order in which product classes were presented affected processing strategies, it is possible that interactions of the above effects with order could affect the interpretation of these analyses. The detailed analyses in Appendix V indicated no interactions with order which would alter the conclusion that observed correlations between attributes have little effect on product evaluations.

Retrospective comments. Although the product evaluations were completed without difficulty, time constraints prevented the collection of retrospective comments from many subjects. The following analyses are based on the 254 subjects who completed the retrospective comments task.

Retrospective comments were coded for frequency of mentioning an attribute not contained in the description and frequency of making an inference (explicitly stating an assumed value or an expected relationship between known and missing information) about such attributes. Coding was completed by an experienced coder from Experiment I.

Proportions of subjects mentioning and inferring missing attributes for the consistent and inconsistent two-attribute contexts are Table 7-17. These proportions were transformed into logits and analyzed via a weighted least squares analysis with context

Table 7-17
Proportions of Subjects Mentioning and Inferring Missing Attributes

Product Class	Mentions		Inferences	
	Consistent	Inconsistent	Consistent	Inconsistent
Refrigerators	.58	.68	.20	.30
Carpet Cleaners	.38	.33	.14	.04

Table 7-18
Significance Tests
Proportions of Subjects Mentioning and Inferring Missing Attributes in Consistent and Inconsistent Two-Attribute Contexts

Dependent Variable	Refrigerators			Carpet Cleaners		
	n	Chi square	*p*	*n*	Chi square	*p*
Mentions	136	1.02	.3120	118	.34	.5617
Inferences	136	.61	.4351	118	.01	.9126

df=1

(two-attribute consistent and two-attribute inconsistent) as a between subjects factor. The test statistic is a Wald (1943) chi square statistic. Because it was desirable to establish the absence of this effect, an alpha level of .10 was adopted for these tests.

These analyses are summarized in Table 7-18. There were no significant differences between contexts in the proportion of subjects mentioning or inferring a missing attribute. It may be concluded that the extent to which attribute correlations were consistent with expectations had no effect on either of these variables.

Summary. There were few differences in product evaluations between the consistent and inconsistent two-attribute contexts, and no differences in the proportion of subjects mentioning or making an inference about a missing attribute. Therefore, it appears unlikely that the factorial manipulation of attribute attractiveness in Experiment I discouraged subjects from making inferences based on expected correlations between attributes. The extent to which attribute correlations are consistent with expectations has no obvious effects on processing strategy.

Information Context

Because observed correlations between attributes appeared to have little effect on processing strategy, data from the two-attribute consistent and two-attribute inconsistent contexts were combined for the remaining analyses. As in Experiment I, product evaluations and retrospective comments were examined for evidence that inferences were being made as hypothesized. Although attribute correlations did not appear to affect processing strategy, it is possible that the reduction in the number of evaluations to be made in this study encouraged elaborative processing and thus increased the likelihood that inferences would be made about missing attributes.

Product evaluations. Interest focuses on evaluations of the test descriptions. The effects of interest are the main effect of context and the context x attractiveness of the known attribute interaction. It is predicted that evaluations in the two-attribute context will be less favorable than evaluations in the one-attribute context. This is because of the posited negative bias in inferences, which are predicted to be made only in the two-attribute context. It is also predicted that evaluations in the two-attribute context will exhibit systematic differences in linear and quadratic trends when compared with evaluations in the one-attribute context. These differences result from inferences which are expected to be made and averaged into overall evaluations only in the two-attribute context. The exact nature of predicted differences in trend depends upon the expected relationship between known and missing attributes.

Means and _F_ statistics for the main effect of context are in Tables 7-19 and 7-20 for the refrigerators and carpet cleaners, respectively. Although there are some exceptions, these data are generally consistent with the prediction that evaluations will be less favorable in the two-attribute context. As predicted, evaluations were significantly less favorable in the two-attribute context in nine of the sixteen cases tested. Differences in means were in the predicted direction in four other cases. For most evaluations based on information about carpet cleaner area cleaned, however, evaluations were more favorable in the two-attribute context than in the one-attribute context, although only one of these differences was

Table 7-19
Context Main Effect for Refrigerators

Known Attribute	Missing Attribute (Two-attribute Context)	Test Description Means One-Attribute Context	 Two-Attribute Context	*F*	*p*
Capacity	Warranty	.57	-1.61	26.60*	.0001
Capacity	Shelf space	.57	-.91	16.49*	.0002
Capacity	Energy cost	.57	-.31	5.18*	.0273
Capacity	Price	.57	.33	.32	.5731
Warranty	Capacity	.58	-.66	10.26*	.0024
Shelf space	Capacity	.02	-.46	3.07	.0860
Energy cost	Capacity	.62	-.23	4.06*	.0495
Price	Capacity	.18	-.59	7.62*	.0082

*$p < .05$

Table 7-20
Context Main Effect for Carpet Cleaners

Known Attribute	Missing Attribute (Two-attribute Context)	Test Description Means One-Attribute Context	 Two-Attribute Context	*F*	*p*
Area cleaned	Versatility	-.12	.81	7.54*	.0085
Area cleaned	Tank capacity	-.12	.35	3.02	.0888
Area cleaned	Weight	-.12	-.19	.04	.8386
Area cleaned	Price	-.12	.53	3.11	.0844
Versatility	Area cleaned	.94	.60	1.61	.2103
Tank capacity	Area cleaned	-.20	-.98	7.82*	.0074
Weight	Area cleaned	-.20	-.96	4.45*	.0401
Price	Area cleaned	-.07	-1.70	21.73*	.0001

*$p < .05$

significant. Descriptions based on area cleaned were rated somewhat negatively in the one-attribute context, and rated somewhat positively in three of the four two-attribute contexts.

Means and F statistics for the context x attractiveness of the known attribute interaction are in Tables 7-21 and 7-22. Evaluations are plotted as a function of the attractiveness of the known attribute in Figures 7-1 through 7-10. These data are generally inconsistent with predictions about systematic patterns in linear and quadratic trends in the two-attribute context. Instead, as in Experiment I, there appears to be a general tendency for the impact of the known attribute on overall evaluations to be less in the two-attribute context. This is indicated by a less steep slope in the two-attribute context when evaluations are plotted as a function of the attractiveness of the known attribute.

When there is expected to be no relationship between the known and missing attributes, the inference model predicts that evaluations in the two-attribute context will have a less steep slope than evaluations in the one-attribute context, with the slope being least steep at the most attractive levels of the known attribute. (All of the predictions for the context x attractiveness of the known attribute interaction are illustrated in Figure 6-1.) Planned comparisons should indicate a significant difference in both linear and quadratic trends between the one- and two-attribute contexts.

There are four comparisons for which there is expected to be no relationship between the known and missing attributes. Evaluations based on refrigerator capacity when warranty is missing are plotted in Figure 7-1. Although the pattern in evaluations corresponds roughly

Table 7-21
Context x Attractiveness of Known Attribute Interaction for Refrigerators

Known Attribute	Missing Attribute (Two-Attribute Context)	Linear			Quadratic		
		Predicted	F	p	Predicted	F	p
Capacity	Warranty	yes	1.91	.1737	yes	.14	.7142
Capacity	Shelf space	no	.08	.7846	no	1.83	.1821
Capacity	Energy cost	yes	1.63	.2075	yes	.17	.6828
Capacity	Price	yes	.09	.7605	yes	.48	.4898
Warranty	Capacity	yes	7.43*	.0089	yes	5.96*	.0184
Shelf space	Capacity	no	5.90*	.0189	no	.04	.8468
Energy cost	Capacity	yes	.21	.6490	yes	.15	.6960
Price	Capacity	no	5.53*	.0229	yes	.02	.8855

*$p < .05$

Table 7-22
Context x Attractiveness of the Known Attribute Interaction for Carpet Cleaners

Known Attribute	Missing Attribute (Two-attribute Context)	Linear			Quadratic		
		Predicted	F	p	Predicted	F	p
Area cleaned	Versatility	yes	32.57*	.0001	yes	.27	.6084
Area cleaned	Tank capacity	no	11.45*	.0014	no	5.80*	.0199
Area cleaned	Weight	yes	16.09*	.0002	yes	.65	.4225
Area cleaned	Price	yes	22.00*	.0001	yes	1.33	.2545
Versatility	Area cleaned	yes	3.19	.0806	yes	.16	.6894
Tank capacity	Area cleaned	no	12.96*	.0008	no	.36	.5525
Weight	Area cleaned	yes	6.22*	.0162	yes	.95	.3351
Price	Area cleaned	yes	3.48	.0681	yes	.14	.7065

*$p < .05$

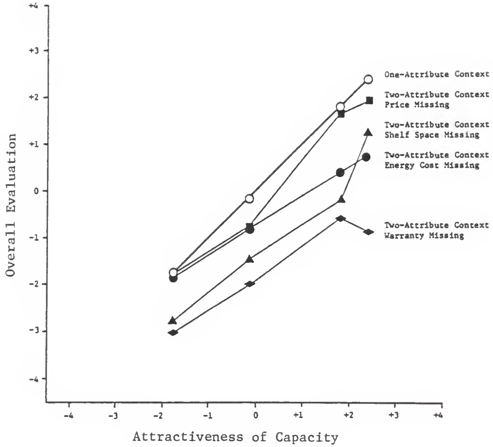

Figure 7-1
Refrigerator Evaluations
Based on Information about Capacity

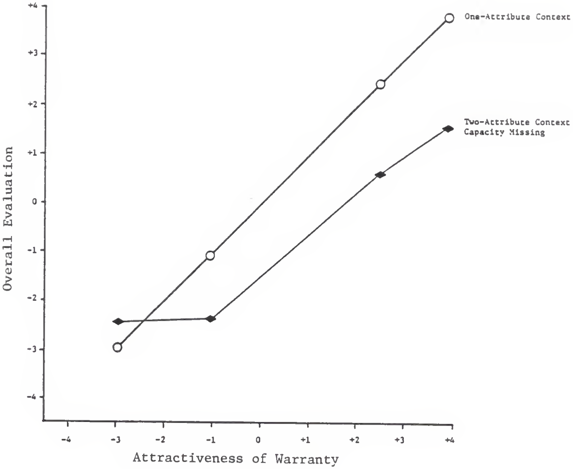

Figure 7-2
Refrigerator Evaluations
Based on Information about Warranty

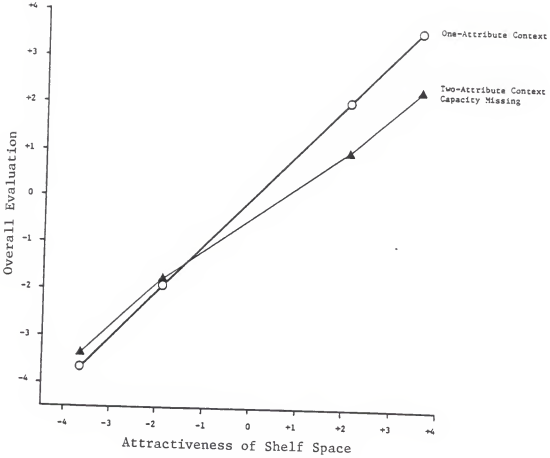

Figure 7-3
Refrigerator Evaluations
Based on Information about Shelf Space

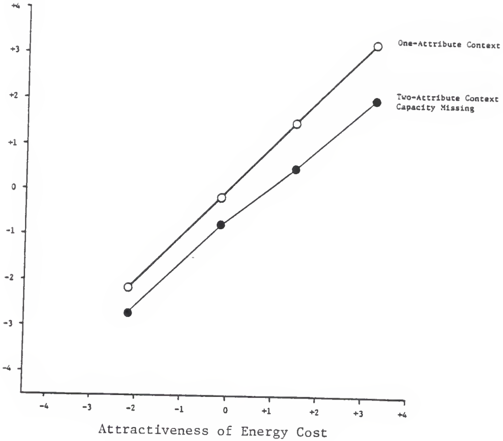

Figure 7-4
Refrigerator Evaluations
Based on Information about Energy Cost

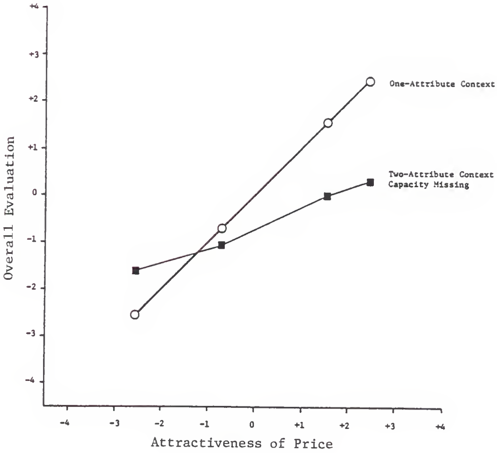

Figure 7-5
Refrigerator Evaluations
Based on Information about Price

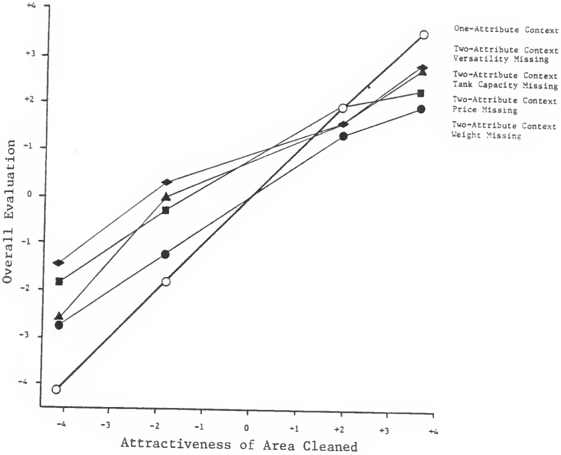

Figure 7-6
Carpet Cleaner Evaluations
Based on Information about Area Cleaned

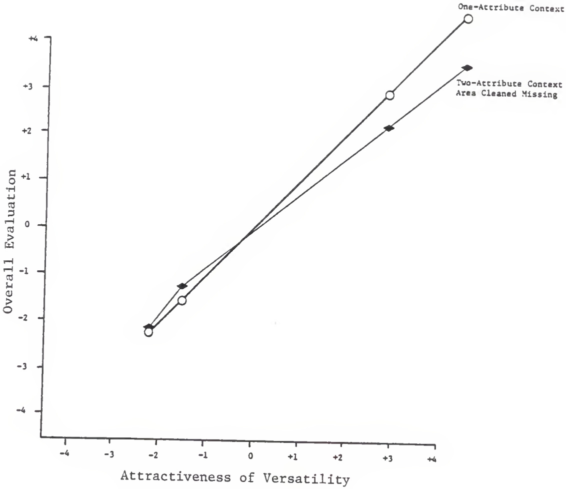

Figure 7-7
Carpet Cleaner Evaluations
Based on Information about Versatility

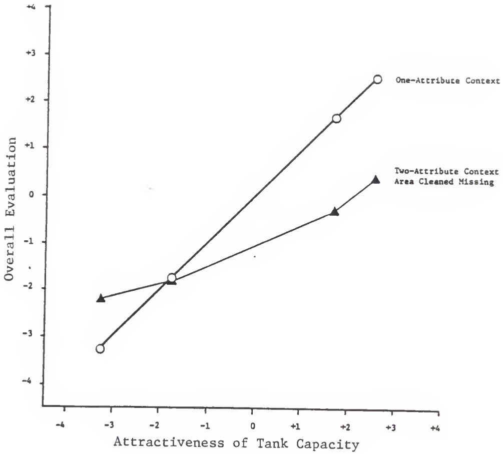

Figure 7-8
Carpet Cleaner Evaluations
Based on Information about Tank Capacity

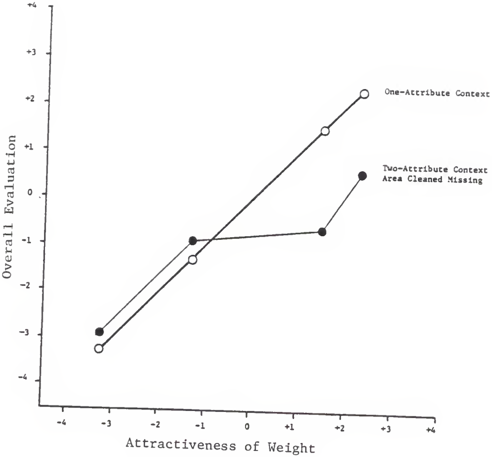

Figure 7-9
Carpet Cleaner Evaluations
Based on Information about Weight

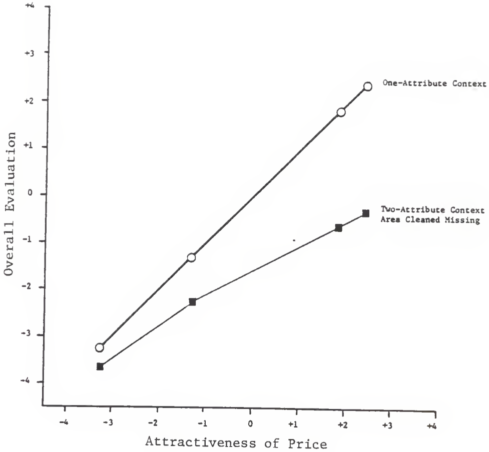

Figure 7-10
Carpet Cleaner Evaluations
Based on Information about Price

to the prediction, there was no significant difference in either linear or quadratic trend between the two contexts. Evaluations based on warranty when capacity is missing are plotted in Figure 7-2. Here the pattern in evaluations is not consistent with predictions, although there is a significant difference in linear and quadratic trends between contexts.

Evaluations based on carpet cleaner area cleaned when versatility is missing are plotted in Figure 7-6. The slope is significantly less steep in the two-attribute context as predicted, but there is no difference in quadratic trend. Evaluations based on versatility when area cleaned is missing are plotted in Figure 7-7. It appears that the slope is less steep in the two-attribute context, but this difference is not significant. The difference in quadratic trend is also nonsignificant.

When there is expected to be a positive correlation between the evaluative implications of the known and missing attributes, the inference model predicts that slopes in the one- and two-attribute contexts will be identical. Planned comparisons should indicate no differences in either linear or quadratic trends.

There are four comparisons for which there is expected to be a positive correlation between the evaluative implications of the known and missing attributes. Evaluations based on refrigerator capacity when shelf space is missing are plotted in Figure 7-1. As predicted, the slopes in the one-attribute and the two-attribute context appear to be identical and there is no significant difference in linear or quadratic trend between contexts. Evaluations based on shelf space when capacity is missing are plotted in Figure 7-3. Contrary to prediction, the slope is significantly less steep in the two-attribute context.

Evaluations based on carpet cleaner area cleaned when tank capacity is missing are plotted in Figure 7-6. Contrary to prediction, the slope is significantly less steep in the two-attribute context. Evaluations based on tank capacity when area cleaned is missing are plotted in Figure 7-8. Again, contrary to prediction, the slope is significantly less steep in the two-attribute context.

When there is expected to be a negative correlation between the evaluative implications of the known and missing attributes, the inference model predicts that evaluations in the two-attribute context will exhibit an inverted U-shaped function, with the slope changing from positive to negative at more attractive levels of the known attribute. Planned comparisons should indicate significant differences in both linear and quadratic trends.

There are eight comparisons for which there is expected to be a negative correlation between the evaluative implication of the known and missing attributes. Evaluations based on refrigerator capacity when energy cost is the missing attribute and when price is the missing attribute are plotted in Figure 7-1. Although the slope appears to be less steep in the two-attribute context for both of these comparisons, the difference in both linear and quadratic trends is nonsignificant. Evaluations based on energy cost when capacity is the missing attribute are plotted in Figure 7-4, and evaluations based on price when capacity is the missing attribute are plotted in Figure 7-5. For both of these comparisons, the slope is significantly less steep in the two-attribute context, but the difference in quadratic trend is nonsignificant.

Evaluations based on carpet cleaner area cleaned when weight is the missing attribute and when price is the missing attribute are plotted in Figure 7-6. Although the slope appears to be less steep in the two-attribute context for both of these comparisons, this difference is significant only when price is the missing attribute. In neither case is the difference in quadratic trend significant. Evaluations based on weight when area cleaned is the missing attribute are plotted in Figure 7-9. The slope is significantly less steep in the two-attribute context, and there is no difference in quadratic trend. Evaluations based on price when area cleaned is the missing attribute are plotted in Figure 7-10. Although the slope appears to be less steep in the two-attribute context, the difference is not significant. The difference in quadratic trend is also nonsignificant.

If the main effect of context or the context x attractiveness of the known attribute interaction were involved in interactions with other design factors, then the interpretation of these planned comparisons might be altered. To examine this possibility, an analysis of variance was conducted which included the design factor order of presentation of the product class. This analysis is described in Appendix V. It indicated no problems with the interpretation of the planned comparisons.

Retrospective comments. It is predicted that subjects in the two-attribute context will be more likely to mention a missing attribute, and more likely to make an inference about missing attributes. While the prediction regarding the likelihood of mentioning a missing attribute was generally supported, the prediction regarding the likelihood of making an inference about a missing attribute was not supported.

Proportions of subjects mentioning and inferring missing attributes are in Table 7-23. These proportions were transformed into logits and analyzed via a weighted least squares analysis with context (one-attribute and two-attribute) and order of presentation (one-attribute context first or two-attribute context first) as between subjects factors and attractiveness of the known attribute (very unattractive and very attractive) as a within subjects factor. The test statistic is a Wald (1943) chi square statistic.

The analysis for the dependent variable proportion mentioning missing attributes is summarized in Tables 7-24 and 7-25 for refrigerators and carpet cleaners, respectively. For the refrigerator product class, there were significant main effects of context, order, and attractiveness. As predicted, the likelihood of mentioning a missing attribute was greater in the two-attribute context. The likelihood of mentioning a missing attribute was also greater when the one-attribute context was presented first and when the product description was very attractive. The proportion of subjects mentioning a missing attribute was .52 when the one-attribute context was presented first and .38 when the two-attribute context was presented first. The proportion of subjects mentioning a missing attribute was .50 for very attractive descriptions and .37 for very unattractive descriptions.

Table 7-23
Proportions of Subjects Mentioning and Inferring Missing Attributes

Product Class	Mentions		Inferences	
	One-Attribute Context	Two-Attribute Context	One-Attribute Context	Two-Attribute Context
Refrigerators	.22	.63	.16	.25
Carpet Cleaners	.25	.35	.21	.09

Table 7-24
Significance Tests
Proportion of Subjects Mentioning a Missing Attribute
Refrigerators

Source	*df*	Chi square	*p*
Between			
Context	1	46.85*	.0001
Order	1	5.75*	.0165
Context x order	1	.01	.9290
Within			
Attractiveness	1	13.44*	.0002
Attractiveness x context	1	.54	.4617
Attractiveness x order	1	.39	.5333
Attractiveness x context x order	1	0.00	.9437

$^*p < .05$

Table 7-25
Significance Tests
Proportion of Subjects Mentioning a Missing Attribute
Carpet Cleaners

Source	*df*	Chi square	*p*
Between			
Context	1	7.89*	.0050
Order	1	.71	.3979
Context x order	1	5.20*	.0226
Within			
Attractiveness	1	2.92	.0877
Attractiveness x context	1	0.00	.9800
Attractiveness x order	1	.46	.4957
Attractiveness x context x order	1	1.58	.2089

$^*p < .05$

For the carpet cleaner product class, there was a significant context x order interaction. The simple effects of context were examined for each order. This analysis is summarized in Table 7-26. When the one-attribute context was presented first, there was a significant effect of context, with the likelihood of mentioning a missing attribute being greater in the two-attribute context. These proportions were .15 and .41 for the one- and two-attribute contexts, respectively. When the two-attribute context was presented first, the context effect was not significant. The proportion mentioning a missing attribute for the one-attribute context was .34 and for the two-attribute context was .29, a difference in the opposite direction to that predicted.

The analysis for the dependent variable proportion making an inference is summarized in Tables 7-27 and 7-28 for refrigerators and carpet cleaners, respectively. There were no significant effects for the refrigerator product class, while the likelihood of making an inference was significantly lower in the two-attribute context for the carpet cleaner product class.

These results are quite similar to those of Experiment I. While the likelihood of noticing a missing attribute is generally higher in the two-attribute context, the likelihood of making an inference is not higher in this context. In the carpet cleaner product class, the likelihood of making an inference is actually lower in the two-attribute context.

To obtain a sufficiently large $\underline{n}$ for these statistical tests, it was necessary to collapse across all known and missing attribute combinations in a product class. Although the resulting $\underline{n}$'s are too

Table 7-26
Simple Effects of Context
Proportion of Subjects Mentioning a Missing Attribute
Carpet Cleaners

Source	*df*	Chi square	*p*
First Context	1	12.19*	.0005
Second Context	1	.08	.7820

*$p < .05$

Table 7-27
Significance Tests
Proportion of Subjects Inferring a Missing Attribute
Refrigerators

Source	_df_	Chi square	_p_
Between			
Context	1	.10	.7574
Order	1	.03	.8562
Context x order	1	0.00	.9994
Within			
Attractiveness	1	.18	.6721
Attractiveness x context	1	.01	.9037
Attractiveness x order	1	.53	.4653
Attractiveness x context x order	1	.19	.6661

Table 7-28
Significance Tests
Proportion of Subjects Inferring a Missing Attribute
Carpet Cleaners

Source	_df_	Chi square	_p_
Between			
Context	1	4.41*	.0357
Order	1	.84	.3598
Context x order	1	.45	.5018
Within			
Attractiveness	1	.07	.7896
Attractiveness x context	1	.44	.5078
Attractiveness x order	1	.17	.6770
Attractiveness x context x order	1	.65	.4185

$^{*}p < .05$

small for statistical tests, it is useful to examine proportions of subjects mentioning and making inferences about missing attributes for each known and missing attribute combination. These data are provided in Tables 7-29 through 7-32. In these tables, missing attributes mentioned or inferred are classified into two categories: test attributes and other attributes. For each comparison between the one- and two-attribute contexts, the test attribute is the missing attribute which is made salient in the two-attribute context. For example, when the one-attribute context in which all refrigerators are described only in terms of capacity is compared with the two-attribute context in which information is normally available about both capacity and warranty, warranty is the test attribute. Any other attributes mentioned (other than capacity, for which information is available) are classified as other attributes.

Recall that it was suggested in Chapter VI that the two-attribute context may divert attention away from attributes which are considered in the one-attribute context. For example, evidence suggested that subjects evaluating products based on information about price often thought about quality in the one-attribute context. In the two-attribute context, however, they were less likely to think about quality. It was suggested that this was because the missing attribute made salient in the two-attribute context (capacity for refrigerators and area cleaned for carpet cleaners) diverted attention away from quality. If this process generally occurs, it is expected that attention to test attributes will increase in the two-attribute context, while attention to other attributes will decrease.

Table 7-29
Proportions of Subjects Mentioning Missing Attributes
Refrigerators

Known Attribute	Missing Attribute (Two-Attribute Context)	One-Attribute Context			Two-Attribute Context		
		Test	Other	Total	Test	Other	Total
Capacity	Warranty	0.00	.09	.09	.73	0.00	.73
Capacity	Sh. space	0.00	.09	.09	.61	.06	.67
Capacity	En. cost	0.00	.09	.09	.56	.08	.64
Capacity	Price	.07	.02	.09	.47	.03	.50
Warranty	Capacity	.04	.17	.21	.62	.09	.71
Sh. space	Capacity	.35	.04	.40	.71	.09	.79
En. cost	Capacity	0.00	.04	.04	.69	.08	.78
Price	Capacity	.02	.26	.28	.44	0.00	.44

Table 7-30
Proportions of Subjects Mentioning Missing Attributes
Carpet Cleaners

Known Attribute	Missing Attribute (Two-Attribute Context)	One-Attribute Context			Two-Attribute Context		
		Test	Other	Total	Test	Other	Total
Area cl.	Vers.	0.00	.07	.07	.54	.04	.57
Area cl.	Tank cap.	0.00	.07	.07	.32	.07	.39
Area cl.	Weight	0.00	.07	.07	.29	.03	.32
Area cl.	Price	.02	.06	.07	.58	0.00	.58
Vers.	Area cl.	0.00	.06	.06	.03	0.00	.03
Tank cap.	Area cl.	.50	.04	.54	.46	.04	.50
Weight	Area cl.	.14	.26	.40	.28	.14	.42
Price	Area cl.	0.00	.34	.34	.17	.03	.20

Table 7-31
Proportions of Subjects Inferring Missing Attributes
Refrigerators

Known Attribute	Missing Attribute (Two-Attribute Context)	One-Attribute Context			Two-Attribute Context		
		Test	Other	Total	Test	Other	Total
Capacity	Warranty	0.00	.04	.04	.63	0.00	.63
Capacity	Sh. space	0.00	.04	.04	.50	.06	.56
Capacity	En. cost	0.00	.04	.04	.03	0.00	.03
Capacity	Price	.02	.02	.04	.10	0.00	.10
Warranty	Capacity	.04	.13	.17	0.00	.09	.09
Sh. space	Capacity	.35	.02	.38	.50	.09	.59
En. cost	Capacity	0.00	0.00	0.00	.06	0.00	.06
Price	Capacity	.02	.14	.16	0.00	0.00	0.00

Table 7-32
Proportions of Subjects Inferring Missing Attributes
Carpet Cleaners

Known Attribute	Missing Attribute (Two-Attribute Context)	One-Attribute Context			Two-Attribute Context		
		Test	Other	Total	Test	Other	Total
Area cl.	Vers.	0.00	.04	.04	.07	.04	.11
Area cl.	Tank cap.	0.00	.04	.04	0.00	.07	.07
Area cl.	Weight	0.00	.04	.04	0.00	.03	.03
Area cl.	Price	0.00	.04	.04	0.00	.08	.08
Vers.	Area cl.	0.00	0.00	0.00	0.00	0.00	0.00
Tank cap.	Area cl.	.48	.02	.50	.25	.04	.29
Weight	Area cl.	.14	.22	.36	.08	.06	.14
Price	Area cl.	0.00	.26	.26	.07	.03	.10

Table 7-29 presents proportion of subjects mentioning missing attributes in the refrigerator product class. The incidence of mentioning missing attributes was greater in the two-attribute context for all known and missing attribute combinations. Most of this increase comes from increased likelihood of mentioning the test attribute. There appears to be slight decrease in the likelihood of mentioning other missing attributes in the two-attribute context, although the incidence of mentioning missing attributes was so low in the one-attribute context that there is little margin for decrease.

For two of the comparisons, however, enough subjects in the one-attribute context mentioned the same missing attribute that it is easy to see that the two-attribute context diverted attention from that attribute. When refrigerators were described in terms of warranty or price, subjects in the one-attribute context sometimes mentioned quality. The proportion of subjects mentioning quality were .15 and .17 for descriptions based on warranty and price, respectively. In the two-attribute context, these proportions were .09 and 0.00. The salient missing attribute in this context, capacity, seemed to divert attention away from quality. This is exactly the same pattern which occurred in Experiment I.

Proportions of subjects mentioning a missing attribute in the carpet cleaner product class are reported for every known and missing attribute combination in Table 7-30. Again, the effect of the two-attribute context appears to be to increase attention to the test attributes, while somewhat decreasing attention to other missing attributes. There is again evidence that the two-attribute context diverted attention away from quality. When carpet cleaners were described in terms price, the proportion of subjects mentioning quality in the one-attribute context was .30. In the two-attribute context, this proportion was .03.

Table 7-31 contains proportions of subjects making inferences about missing attributes in the refrigerator product class. Although, on the average, the information context manipulation had little effect on inference making, inferences did increase considerably in the two-attribute context for three of the eight comparisons: when capacity was known and warranty was missing, when capacity was known and shelf space was missing, and when shelf space was known and capacity was missing.

When warranty was missing, the most common inference was that the refrigerator offered no warranty. When shelf space was missing, the most common inference was that the refrigerator had no shelves. These two attributes are different from the other refrigerator attributes in that it is possible for these attributes to be absent. In contrast, all refrigerators offered for sale must have some capacity, some energy cost to operate, and some price. It may be that consumers readily infer the absence of an attribute, but do not readily infer the value of an attribute which is known to be present.

When inferences were made about capacity based on information about shelf space, subjects generally assumed that shelf space and capacity are positively correlated. This inference was fairly likely to be made in both the one-attribute and the two-attribute contexts. The two-attribute context may have simply encouraged an inference making process that was already more or less automatic for many subjects.

Except for these three known and missing attribute combinations, the two-attribute context did not appear to increase the likelihood of inference making. For evaluations based on warranty and price, inference making actually appeared to decrease in the two-attribute context. When warranty was known, the proportion of subjects making inferences about quality was .12 in the one-attribute context and .09 in the two-attribute context. When price was known, the proportion of subjects making inferences about quality was .14 in the one-attribute context and 0.00 in the two-attribute context.

Table 7-32 contains proportions of subjects making inferences about missing attributes in the carpet cleaner product class. The information context manipulation does not appear to have had much effect on the incidence of inference making. One reason that there is even less inference making for carpet cleaners than for refrigerators may be that none of the carpet cleaner attributes are like warranty and shelf space; none of them can possibly be absent. There was again evidence that the two-attribute context actually decreases the likelihood of certain inferences. When price was known, the proportion of subjects making inferences about quality in the one-attribute context was .24, and in the two-attribute context was .03.

Interestingly, the incidence of making inferences about area cleaned based on tank capacity was actually higher in the one-attribute context, despite the fact that area cleaned was the salient missing attribute in the two-attribute context.

Thus the retrospective comments yield results very similar to those of Experiment I. The incidence of mentioning missing attributes increases in the two-attribute context, while there is little difference in the incidence of inference making between contexts. It appears that the two-attribute context focuses attention on the missing attribute for which information is typically available in that context, and may often divert attention away from attributes which would otherwise be considered. Inferences are perhaps more likely to be made in the two-attribute context when it is possible to infer that the attribute is absent.

Discussion

Methodological Issues

Experiment II was designed to address a number of methodological issues which were raised when the results of Experiment I indicated that inferences about missing attributes were made infrequently.

It was thought that zero correlations in observed product sets in Experiment I may have discouraged inference making based on expected relationships. A manipulation of the correlation between attributes was introduced to address this concern. In two-attribute contexts, product descriptions were constructed so that correlations were either consistent or inconsistent with expectations. It was expected that if zero correlations between attributes in Experiment I inhibited inference making, then inferences would be likely to be made in the consistent context, but not in the inconsistent context. Both product evaluations and retrospective comments were examined for evidence that the correlation between attributes in observed product sets affected processing strategy. These analyses uncovered no systematic differences in the way products were evaluated in these contexts. It was therefore concluded that the zero correlations in Experiment I were not responsible for the low incidence of inference making.

It also seemed possible that the large number of evaluations subjects were asked to make in Experiment I may have discouraged elaborative processing such as inference making. To address this concern, the number of product evaluations each subject made was reduced from 56 to 20. As both product evaluations and retrospective comments indicated little difference in processing from Experiment I, it may be concluded that the processing load in Experiment I was not responsible for the low incidence of inference making. It is possible that inferences are only made when processing loads are even lower than in this study; however, these findings strongly suggest that inference making is not a pervasive response to missing information.

Because Experiment I had shown some fairly consistent effects of the information context manipulation despite the low incidence of inference making, the possibility that these effects were attributable to differences in the use of the response scale by subjects in different contexts was examined. Both range and frequency effects were considered.

Range effects were controlled for by having subjects in every context rate identical evaluatively extreme alternatives prior to rating the products. Theoretically, this procedure should have insured that the psychological range of evaluations was identical in all information contexts. Ratings of the evaluatively extreme alternatives showed little change over the course of the product evaluation task, providing evidence that there was considerable similarity in the psychological range of the response scale in different information contexts.

Frequency effects were examined via a models comparison procedure. It was found that there was both a main effect of context and a context x attractiveness of the known attribute interaction which could not be entirely accounted for by differences in the rank order of product evaluations in different information contexts. Together, the range and frequency analyses provided fairly convincing evidence that there were real differences in evaluations between the one- and two-attribute contexts.

Information Context Effects

The effects of information context were similar to those observed in Experiment I. Patterns in evaluations were generally not consistent with predictions from the inference model. There were systematic differences in evaluations in the one- and two-attribute contexts, however. There was a main effect of context, with evaluations generally being less favorable in the two-attribute context. There was also a tendency for the impact of the known attribute on overall evaluations to be less in the two-attribute context.

Retrospective comments again supported the interpretation of the evaluation data as indicating that the incidence of inference making was generally quite low. Some exceptions to this generalization were noted, however. As in Experiment I, there were some attributes, specifically warranty, price, refrigerator shelf space, and carpet cleaner tank capacity, which were moderately likely to prompt inferences in the one-attribute context. Of these attributes, only shelf space was likely to prompt inferences in the two-attribute context. For evaluations based on warranty and price, inferences appeared to be less likely to be made in the two-attribute context because that context focused attention on another missing attribute and away from quality, the attribute most frequently inferred in the one-attribute context. For evaluations based on tank capacity, it is unclear why inference making decreased in the two-attribute context. The attribute most frequently inferred in the one-attribute context was area cleaned. As area cleaned was the missing attribute in the two-attribute context, it would be expected that these inferences would increase in the two-attribute context, but this did not occur.

Overall, however, the retrospective comments are consistent with the notion that the two-attribute context diverts attention to the missing attribute for which information is normally available in that context, and away from other missing attributes which would ordinarily be considered. As suggested earlier, it is possible that the salient missing attribute also takes attention away from known product information. The decrease in inferences about quality in the two-attribute context may be interpreted as a reduction in the amount of elaborative processing allocated to known information. The effect is obvious when it results in the supression of inference making, but may be harder to detect in retrospective comments when there is limited inference making to suppress. It does, however, explain the lower impact of the known attribute on overall evaluations in the two-attribute context.

Another exception to the generalization that the incidence of inference making was generally quite low occured for evaluations based on refrigerator capacity when either warranty or shelf space was the missing attribute in the two-attribute context. Although inferences were not generally made about these attributes in the one-attribute context, inferences were made fairly frequently in the two-attribute context. The inferences were not made in the predicted manner, however. When subjects made inferences about warranty or shelf space, they generally inferred that the refrigerator had no warranty or no shelves. These were the only two attributes employed in the study which may be present or absent. The other attributes, such as capacity, price, weight, and so forth, are necessarily present; it is only their value which is not known. It may be that this relatively simple inference making strategy is employed for salient missing attributes which may be present or absent, but that inferences are less frequently made about the specific values of missing attributes.

Experiments III and IV

Findings from the first two experiments suggest that noticing a missing attribute is an attention-consuming activity which affects the processing of known information. If this proposition is correct, it implies that missing information not only has an immediate effect on product evaluations, but that it also influences the retention of presented product information. If less attention is paid to presented information, then it may be less well encoded in long term memory and less likely to be retrieved at a later time.

The proposition that noticing missing information is an attention-consuming activity relies heavily on the retrospective comments from Experiments I and II. Two further experiments were conducted to clarify this interpretation. In both studies, product evaluations were again collected in both the one-attribute and the two-attribute contexts.

Experiment III addresses the issue of whether retrospective comments correctly capture processing strategy. Concern that the retrospective comments may not be a valid index of cognitive processing rests on the assumption that the time of verbalization determines the cognitive basis of obtained protocols. While the cognitive basis of concurrent verbalizations is recently processed information which is directly accessible, the cognitive basis of retrospective verbalizations is less recently processed information which is not directly accessible. Therefore it is possible that the retrospective comments incorrectly represent the processing of these product descriptions because the relevant cognitive processes either were not encoded in long term memory or are not successfully retrieved from long term memory at the time of verbalization.

To examine this possibility, concurrent verbalizations are collected for product evaluations from a subset of the information contexts employed in Experiments I and II. These concurrent verbalizations are examined for evidence that the product descriptions are processed in a manner different from that indicated by the retrospective comments which have been previously collected.

Experiment IV directly addresses the question of whether noticing a missing attribute is an attention-consuming activity. During the product evaluation task, a measure of the cognitive effort required to evaluate each description is taken. If noticing missing information is an attention-consuming process, it is predicted that the cognitive effort required to evaluate a product description will be greater in the two-attribute context, in which missing attributes are likely to be salient, than in the one-attribute context, in which missing attributes are less likely to be salient.

CHAPTER VIII
EXPERIMENT III

In Experiments I and II, subjects evaluated a set of one-attribute test descriptions which were encountered in one of two information contexts. In the one-attribute context, all alternatives are described in terms of only one attribute. In this context, the test descriptions provide information about the same single attribute as do all other descriptions. In the two-attribute context, most alternatives are described in terms of two attributes. In this context, the test descriptions provide information about only one of the attributes for which information is normally available. It was predicted that in the one-attribute context, inferences would rarely be made about attributes not contained in the test descriptions, but that in the two-attribute context, inferences would be likely to be made about the missing attribute.

Based on the results of these experiments, it was concluded that inference making is not a common response to missing information, as originally hypothesized. Instead, it was proposed that the two-attribute context diverts attention to the missing attribute and away from known product information. If this proposition is correct, and noticing missing attributes is indeed an attention-consuming process, then there are some interesting implications for decisions about the provision of product information. Specifically, the omission of attribute information which is available for other alternatives may be expected to influence both immediate product evaluations and the likelihood that presented information will be retained and subsequently retrieved to support the product choice process. Because less attention is allocated to presented information, it will have less impact, positive or negative, on immediate product evaluations. In addition, it will be less likely to be encoded into long term memory in association with appropriate retrieval cues so that it may be readily recalled at a later time.

The data which support this proposition include product evaluations and retrospective comments about the evaluation process. Product evaluations in the two-attribute context generally do not exhibit the patterns predicted by an inference model, while they do exhibit patterns consistent with the proposition that less attention is given to known information in the two-attribute context. Specifically, varying the attractiveness of the known attribute generally has less impact on overall evaluations in the two-attribute context than in the one-attribute context.

Product evaluations, however, provide only indirect evidence about the cognitive processes which lead to these evaluations. In contrast, retrospective comments provide direct evidence about the nature of underlying cognitive processes. The retrospective comments also generally support the above proposition. Subjects infrequently indicate having made an inference about a missing attribute. Their reports exhibit a moderately strong tendency in the two-attribute context to focus on the missing attribute at the expense of other product attributes.

Validity of Retrospective Verbalizations

Although the retrospective comments are an important source of evidence about the evaluation process, a number of concerns about the validity of retrospective comments as indices of cognitive processing must be addressed (Ericsson & Simon, 1980; Wright, 1980). These concerns rest on the assumption that the time of verbalization determines the cognitive basis of verbal protocols. While the cognitive basis of concurrent verbalizations is recently processed information which is in short term or working memory and is directly accessible, the cognitive basis of retrospective verbalizations is less recently processed information which is not directly accessible. For retrospective protocols to correctly reflect the processes of interest, the information must have been encoded in long term memory and must be successfully retrieved at the time of verbalization. Sources of error in protocols which depend on correct recall of the relevant cognitive processes may be categorized as problems with completeness and problems with accuracy.

Completeness

Memory for the details of a given product evaluation may be poor. This is particularly likely to be true because subjects in these studies make a series of at least 20 separate evaluations before retrospective comments are requested. As the trials proceed, cognitive load is likely to interfere with encoding in long term memory. Even when the information is successfully encoded, needed retrieval cues may not later be available, making the information inaccessible. In either case, much of the relevant processes simply are not recalled, and thus cannot be verbalized.

When recall is incomplete, retrospective comments may underestimate the frequency of inference making and other responses to missing information. Such an underestimation is not a serious problem in itself. It simply means that the overall incidence of responding to missing information is higher than indicated. The more serious problem is the possibility of an interaction between information context and completeness of protocols.

Consider the fairly consistent finding that price-quality inferences are frequently made in the one-attribute context, but not in two-attribute contexts. This finding has been taken as evidence that the missing attribute in the two-attribute context (capacity for refrigerators and area cleaned for carpet cleaners) captures attention that would otherwise be allocated to other attributes, such as quality. It is possible that quality inferences are actually made as frequently in the two-attribute context as in the one-attribute context. Retrospective comments may underestimate the frequency with which these inferences are made in the two-attribute context because the salient missing attribute so captures attention that inferences about quality are not well encoded in long term memory. Such an interaction would be particularly interesting because it suggests that some inferences may influence immediate behaviors, but not later behaviors, because the inferences are not recalled.

Accuracy

Interference from successive trials may lead to errors in encoding and retrieval. Because of the similarity of product descriptions in a given information context, a subject may incorrectly encode a process as having occurred more frequently than it actually did, or incorrectly retrieve the process for trials on which it did not actually occur. For example, a subject may incorrectly recall thinking about a missing attribute for all trials in the context when this actually occurred for only one or two of the product descriptions.

Inaccuracies in what is verbalized may also be caused by incomplete recall. When unable to recall a specific trial, the individual may generalize from what is remembered about the general process or about other trials, or may try to use general knowledge (for example, what one should do) to infer a reasonable process. For example, subjects may report thinking about the missing attribute in the two-attribute context, not because this process is actually recalled, but because it seems obvious at the time of verbalization. Such inaccuracies in recall may result in overestimation or underestimation of the incidence of thinking about or inferring various missing attributes, or to a more troublesome interaction of information context with accuracy.

Concurrent Verbalizations

Concurrent protocols do not rely on long term memory, and thus are not subject to the encoding and retrieval biases discussed above. The primary concern with concurrent protocols is whether the verbalizations influence the observed cognitive processes. (In retrospective protocols, this problem can be almost entirely avoided by not informing subjects that they will later be asked how they made their judgments.) Under some circumstances, however, it is reasonable to expect that concurrent verbalizations have a minimal effect on the observed processes, aside from decreasing the speed of performance. This is when verbalization instructions are nondirective ("think aloud" rather than "what about price?") and do not require intermediate processing (as when the information is already verbal) (Ericsson and Simon, 1980).

In order to examine the validity of the retrospective comments data, concurrent protocols were collected for a subset of information contexts from the refrigerator product class. These concurrent verbalizations were then analyzed, and the results were compared to those obtained from the retrospective comments of Experiments I and II.

Method

Subjects

Subjects were 32 undergraduate psychology students who participated in partial fulfillment of a course requirement.

Materials

Product descriptions. It was decided to make processing loads in the one- and two-attribute contexts as similar as possible. In Experiment I, subjects made eight product evaluations in the one-attribute context (four alternatives evaluated twice) and 48 evaluations in the two-attribute context (24 alternatives evaluated twice). Processing loads were made more similar in Experiment II, in which subjects in the one-attribute context evaluated eight alternatives, and subjects in the two-attribute context evaluated twelve alternatives, each alternative being evaluated only once.

In the current study, the number of alternatives evaluated in the one-attribute context was increased to 12, so that the total number of evaluations made in the one- and two-attribute contexts was identical. In order to add four product descriptions to the one-attribute context, four additional descriptions were created for each attribute. As when the number of alternatives in the one-attribute context was increased from four to eight in Experiment II, the new attribute descriptions were created to be similar in evaluative implications to existing descriptions. The new attribute descriptions were used only in the one-attribute contexts. Product descriptions in the two-attribute contexts were the same 12 descriptions employed in Experiment II for the condition in which attribute correlations were consistent with expectations. The additional attribute descriptions are in Appendix VI, and may be compared to the other attribute descriptions in Tables 5-2 and 7-1.

General product descriptions. As in the previous experiments, the task was presented as one of examining products in a catalog in anticipation of making a purchase. Individual product descriptions were preceded by a general product description which purported to apply to all models in the catalog. Because it was important to capture subjects' initial responses to the products and not recollections of previous responses, subjects were not allowed to examine individual product descriptions prior to beginning the product evaluation task. For this reason, the general product descriptions were modified to include range information. For example, in the information context in which information was only available about refrigerator capacity, the general description included the information that the refrigerators ranged in size from 4 cubic feet in capacity up to 25.5 cubic feet in capacity. In the information context in which information was normally provided about both refrigerator capacity and price, the general description included the information that the refrigerators ranged in size from 4 cubic feet in capacity to 25.5 cubic feet in capacity, and carried prices ranging from $350 to $1610.

Task cards. Verbally given task instructions were supplemented with simple illustrations on index cards which could be placed on the table in front of the subject. Service descriptions, general descriptions of products in the product class, and individual product descriptions were also presented on individual index cards.

Dependent Variables

Product evaluations. Each product was evaluated on a seven point scale, ranging from -3 (very unattractive) to +3 (very attractive).

Concurrent protocols. Subjects were asked to think out loud as they evaluated the products. These concurrent verbalizations were tape recorded.

Design

Information context was a between subjects factor. There were four information contexts: (1) a one-attribute context in which only capacity information was available; (2) a two-attribute context in which capacity and price information were typically available, but price information was missing for some alternatives; (3) a one-attribute context in which only information about price was available; and (4) a two-attribute context in which information about capacity and price were typically available, but capacity information was sometimes missing.

Attractiveness of test descriptions was a within subjects factor and was varied across four levels (very unattractive, moderately unattractive, moderately attractive, and very attractive). These four test descriptions always appeared in positions three, six, nine, and twelve. Within these positions, order of presentation was counterbalanced. The counterbalancing scheme is presented in Table 8-1.

Procedure

Subjects were administered the procedure individually. Experimenters gave instructions verbally, following a script which essentially duplicated the Experiment II instructions, with the exception that subjects were asked to verbalize their thought processes as they evaluated the refrigerators. As a warm-up task, subjects evaluated the refrigerator rental services while providing concurrent protocols. All protocols were tape recorded. Experimenters gave non-directive prompts to encourage verbalizations, such as "Please think out loud," "Any more thoughts?" and "What are you thinking?"

Results

Product Evaluations

Interest focuses on evaluations of the test descriptions. If evaluations in this study exhibit patterns similar to those in Experiments I and II, this suggests that providing concurrent verbalizations did not alter the manner in which evaluations were

Table 8-1
Counterbalancing Sequences
Attractiveness of Known Attribute in Test Descriptions

	Position			
Sequence	3	6	9	12
1	1*	2	3	4
2	2	4	1	3
3	3	1	4	2
4	4	3	2	1

* 1 = very unattractive
2 = moderately unattractive
3 = moderately attractive
4 = very attractive

made. The effects of interest are the main effect of context and the context x attractiveness of the known attribute interaction. In Experiments I and II, it was generally found that evaluations in the two-attribute context were less favorable than evaluations in the one-attribute context, and that the impact of the known attribute on overall evaluations was lower in the two-attribute context.

An analysis of variance with information context (one-attribute and two-attribute) and counterbalancing sequence (four sequences) as between subjects factors and attractiveness of the known attribute (very unattractive, moderately unattractive, moderately attractive, and very attractive) as a within subject factor was conducted for each of the two known attributes. These analyses are summarized in Tables 8-2 and 8-3 for the capacity and price, respectively.

Main effect of context. The main effect of context was not significant for evaluations based on capacity, although the difference in means was in the predicted direction. The mean evaluation in the one-attribute context was -.41, while in the two-attribute context it was -1.34. For evaluations based on price, evaluations were significantly less favorable in the two-attribute context. The mean evaluation in the one-attribute context was -.06, while in the two-attribute context it was -2.31.

Context x attractiveness of the known attribute interaction. This interaction was nonsignificant for both known attributes; however, a graphical analyses indicated nonsignificant differences in both linear and quadratic trends. Product evaluations based on capacity are plotted in Figure 8-1, and product evaluations based on price are plotted in Figure 8-2. In both cases, the slope tends to be

Table 8-2
Analysis of Variance
Refrigerator Evaluations Based on Capacity
(Two-Attribute Context: Capacity and Price)

Source	*df*	*SS*	*MS*	*F*	*p*
Between					
Context	1	13.14	13.14	1.51	.2541
Sequence	3	14.67	4.89	.56	.6550
Context x sequence	3	13.55	4.52	.52	.6810
Subjects(context x sequence)	8	69.63	8.70		
Within					
Attractiveness	3	15.17	5.06	3.12*	.0447
Attractiveness x context	3	10.80	3.60	2.22	.1116
Attractiveness x sequence	9	12.14	1.35	.83	.5934
Att. x context x sequence	9	5.77	.64	.40	.9252
Att. x subjects(context x sequence)	24	38.88	1.62		
	63	193.73			

*$p < .05$

Table 8-3
Analysis of Variance
Refrigerator Evaluations Based on Price
(Two-Attribute Context: Capacity and Price)

Source	*df*	*SS*	*MS*	*F*	*p*
Between					
Context	1	81.00	81.00	45.47*	.0001
Sequence	3	.88	.29	.16	.9178
Context x sequence	3	10.63	3.54	1.99	.1944
Subjects(context x sequence)	8	14.25	1.78		
Within					
Attractiveness	3	16.63	5.54	3.04*	.0485
Attractiveness x context	3	5.38	1.79	.98	.4174
Attractiveness x sequence	9	34.25	3.81	2.09	.0726
Att. x context x sequence	9	21.00	2.33	1.28	.2975
Att. x subjects(context x sequence)	24	43.75	1.82		
	63	227.75			

*$p < .05$

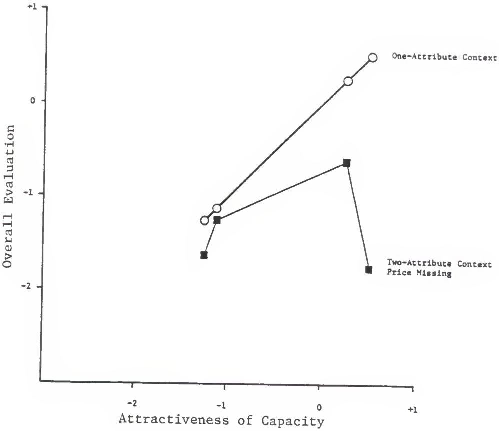

Figure 8-1
Refrigerator Evaluations
Based on Information about Capacity

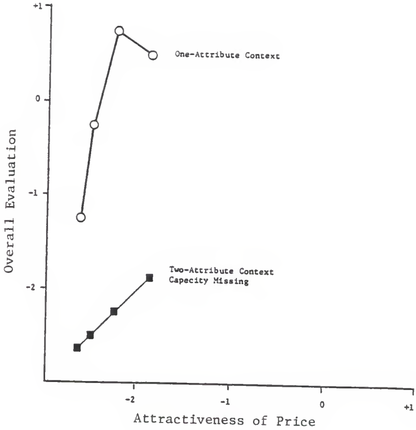

Figure 8-2
Refrigerator Evaluations
Based on Information about Price

less steep in the two-attribute context, as has generally been true in previous studies.

For evaluations based on capacity, the quadratic trend suggests that negative inferences were made about very large refrigerators, but only in the two-attribute context. This is the pattern predicted by the inference model, and has not been observed in the previous studies. This suggests that the concurrent verbalization procedure may have encouraged a difference in processing strategy. It should be noted, however, that in such a small sample, one or two subjects can easily bias means.

For evaluations based on price, the quadratic trend suggests that negative inferences were made about very inexpensive refrigerators in the one-attribute context, and not in the two-attribute context. A similar pattern in evaluations occurred in Experiment I, but not in Experiment II. (In Experiment II, retrospective comments indicated that a number of subjects did infer quality in the one-attribute context, but that few did in the two-attribute context; however, this was not apparent in the evaluation data, probably because more subjects did not make inferences about quality than did.)

Summary. With one exception, these findings are similar to those of previous studies. Evaluations in the two-attribute context tend to be less favorable than evaluations in the one-attribute context. The slope of evaluations in the two-attribute context tends to be less steep than in the one-attribute context. Evaluations based on price suggest that negative inferences were made about low priced products. The only difference is that evaluations based on capacity suggest that negative inferences were made about large refrigerators. The concurrent verbalizations can help indicate whether this is indeed what happened.

Concurrent Protocols

Concurrent protocols were coded for frequency of mentioning an attribute not contained in the description and frequency of making an inference about a missing attribute (explicitly stating an assumed value or an expected relationship between known and missing information) about such attributes. Coding was completed by an experienced coder.

The sample was too small for a weighted least squares logit analysis, so Pearson chi squares and Fisher's exact probabilty tests were used as necessary to examine differences between one- and two-attribute contexts. As these statistics are not intended for correlated measures, separate analyses were conducted for each attractiveness level. Because separate tests were conducted on correlated measures, an alpha level of .0125 was adopted for these tests (.05/4 attractiveness levels).

Proportions of subjects mentioning or inferring missing attributes are in Table 8-4. The analysis for the dependent variable mentioning a missing attribute is summarized in Table 8-5. For the very unattractive, moderately unattractive, and moderately attractive descriptions, the likelihood of mentioning a missing attribute was significantly greater in the two-attribute context. For the very attractive description, the effect was not significant, although the proportion mentioning a missing attribute was also higher in the two-attribute context. These findings are similar to the findings based on retrospective comments in the previous experiments.

Table 8-4
Proportions of Subjects Mentioning and Inferring Missing Attributes

Context	Mentions	Inferences
One-attribute	.27	.20
Two-attribute	.80	.13

Table 8-5
Significance Tests
Proportion of Subjects Mentioning a Missing Attribute

Attractiveness Level	*df*	Chi square	*p*
Very Unattractive	1	10.17*	.0014
Moderately Unattractive	1	10.17*	.0014
Moderately Attractive	1	15.18*	.0001
Very Attractive	1	3.14	.0765

*$p < .0125$

Table 8-6
Significance Tests
Proportions of Subjects Inferring a Missing Attribute

Attractiveness Level	Fisher's Exact Probability
Very Unattractive	.6539
Moderately Unattractive	.5996
Moderately Attractive	1.0000
Very Attractive	1.0000

The analysis for the dependent variable inferring a missing attribute is summarized in Table 8-6. The effects of context were nonsignificant for all attractiveness levels. These findings are also similar to the findings based on retrospective comments in the previous experiments.

To aid in examining the question of whether the missing attribute in the two-attribute context captures attention that would otherwise be allocated to other attributes, attributes mentioned or inferred were classified as test or other attributes. For a given comparison, the test attribute is the missing attribute in the two-attribute context. These data are presented for the dependent variable mentioning a missing attribute in Table 8-7. These data are consistent with the proposition that the two-attribute context diverts attention to the test attribute and away from other attributes.

Table 8-8 presents the same data for the dependent variable proportion of subjects making an inference about a missing attribute. These data are indicate a shift of attention in the two-attribute context away from other attributes and to the test attribute. These data also indicate that, as suggested by the evaluation data, some subjects did make inferences about price in the two-attribute context in which price was the missing attribute. Although this is a small sample upon which to base such a conclusion, it is possible that the process of providing concurrent verbalizations did encourage somewhat more thorough processing, thus increasing the likelihood that such inferences would be made.

Table 8-7
Proportions of Subjects Mentioning Missing Attributes

Known Attribute	Missing Attribute (Two-Attribute Context)	One-Attribute Context			Two-Attribute Context		
		Test	Other	Total	Test	Other	Total
Capacity	Price	.03	.31	.34	.91	0.00	.91
Price	Capacity	0.00	.28	.28	.69	.09	.78

Table 8-8
Proportions of Subjects Inferring Missing Attributes

Known Attribute	Missing Attribute (Two-Attribute Context)	One-Attribute Context			Two-Attribute Context		
		Test	Other	Total	Test	Other	Total
Capacity	Price	0.00	.16	.16	.13	0.00	.13
Price	Capacity	0.00	.25	.25	.09	.03	.13

Discussion

Although it is possible that the concurrent verbalization procedure encouraged somewhat more thorough processing of the product descriptions, there is little evidence that the concurrent protocols more correctly represent the evaluation process than do retrospective comments. The patterns in concurrent verbalizations are essentially the same as patterns in retrospective comments observed in Experiments I and II. While the likelihood of mentioning an attribute not contained in the description was greater in the two-attribute context, there were no overall differences in the likelihood of making an inference between information contexts. The overall levels of mentioning missing attributes and making inferences about missing attributes are very similar to those previously observed.

Contrary to what had been observed in the previous experiments, product evaluation data suggested that price inferences were being made in the two-attribute context in which price information was not available. At the same time, the concurrent verbalizations indicated a higher proportion of subjects making such inferences than had been indicated by retrospective comments in the previous experiments. This suggests that both retrospective comments and concurrent verbalizations are correctly reflecting the extent of inference making which occurs. While this is limited evidence, it further supports the conclusion that retropective comments are fairly valid indicators of the cognitive processes involved in making these simple product evaluations.

CHAPTER IX
EXPERIMENT IV

The preceding studies have been primarily concerned with the effects of missing information on product evaluations. Although the data suggest that inferences are not commonly made about missing attributes as initially hypothesized, there are some fairly consistent effects of missing information. Specifically, when a missing attribute is made salient by the information context in which a product description is encountered, evaluations tend to be less favorable, and the impact of known product information on overall evaluations tends to be less.

The lower impact of known information on overall evaluations has been interpreted as suggesting that less attention is allocated to known information when a missing attribute is made salient by the information context. Verbal protocols have provided some support for this interpretation, suggesting that attention shifts to the missing attribute and away from certain kinds of elaborative processing of known attributes.

It is therefore proposed that noticing missing attributes is an attention-consuming process which decreases the cognitive capacity available for other activities. The product evaluation data and verbal protocols provide indirect evidence that salient missing attributes capture attention that would otherwise be allocated to known attributes. To more directly test the hypothesis that noticing missing information is an attention-consuming process which may be expected to interfere with the processing of available information, the cognitive effort required to make product evaluations was measured.

As in the previous experiments, identical one-attribute test descriptions were evaluated in one of two information contexts. In the one-attribute context, all alternatives were described in terms of the attribute contained in the test description. In this context, it was expected that subjects would rarely think about attributes not contained in the test description. In the two-attribute context, most alternatives were described in terms of two attributes. The test descriptions, however, contained information about only one of these attributes. In this context, it was expected that the missing attribute would be salient, and that subjects would think about it when evaluating the test descriptions.

Noticing the missing attribute is hypothesized to be an attention-consuming process which increases the cognitive effort required to process a product description. It was therefore predicted that more cognitive effort would be required to evaluate the test descriptions in the two-attribute context, in which the missing attribute is likely to be noticed, than in the one-attribute context, in which missing attributes are unlikely to be noticed.

Measuring Cognitive Effort

Cognitive effort is the amount of available capacity which is expended in performing an information processing task (Tyler, Hertel, McCallum, & Ellis, 1979). The cognitive effort required to perform a task is typically measured using the primary task-secondary task paradigm, in which the cognitive effort required by the primary task is indicated by performance on the secondary task (Kerr, 1973; Posner & Boies, 1971; Posner & Klein, 1973). In the current research, for example, subjects could be asked to perform a second task concurrent with the product evaluation task. It would be expected that performance on the secondary task would suffer as the processing demands of the primary product evaluation task increased.

The primary task-secondary task paradigm rests on the assumption that the total effort required to perform the two tasks can be divided into two parts: capacity devoted to the primary task and excess or spare capacity. Subjects are instructed to concentrate on performing the primary task as quickly and as accurately as possible, and at the same time to perform the secondary task as well as possible without sacrificing performance on the primary task. Under these conditions, the secondary task is assumed to consume only spare capacity. While overall capacity is known to increase with increasing demands, this increase occurs at a decreasing rate (Kahneman, 1973). Therefore, as the effort required to perform the primary task increases, there is increasingly less spare capacity available for the secondary task. As effort devoted to the primary task increases, performance on the secondary task suffers.

A commonly used secondary task involves monitoring for a predetermined event and signaling when it occurs. For example, subjects may be asked to press a key each time the digit 3 appears in a string of randomly presented digits. Response latencies coupled with various indices of accuracy (hits, misses, false alarms, etc.) are used to measure performance on the secondary task.

It was decided that this type of secondary task was not well-suited to the current research. This conclusion was based on a consideration of the distinction between momentary effort and total effort demanded by an information processing task (Britton, Westbrook, & Holdredge, 1978). Momentary effort refers to the effort expended at any given moment in time, while total effort refers to the total effort required to complete the task. In the current study, it is predicted that the total effort required to evaluate a description will be greater in the two-attribute context than in the one-attribute context. No predictions are made about momentary effort.

The secondary task described above provides a measure of momentary effort, the effort demanded by the primary task at the time the digit _3_ is presented. With a secondary task of this kind, it is often assumed that average momentary effort provides an index of total effort required by the task. This assumption may be incorrect when the amount of time allocated to primary task trials is allowed to vary. Under these circumstances, momentary effort may sometimes be traded off against total time allocated to the task. That is, more demanding tasks may consume more processing time, but not more momentary effort.

For example, Britton, Westbrook, and Holdredge (1978) found that difficult text material demanded less momentary effort to process than did easy text material, although the difficult material took longer to read. It was suggested that momentary effort is greater for easy text material because processing is not interupted by failures in comprehension; therefore cognitive processors remain filled. For difficult material, failures in comprehension frequently interupt the process, emptying some cognitive processors and freeing capacity for secondary task performance. These failures in comprehension lower the average momentary effort consumed by the task, but result in the task requiring much longer to complete. The effort required to read difficult text is thus reflected chiefly in time allocated to the task.

Britton et al. suggested that total effort may be estimated by multiplying momentary effort by total time spent on the task. Lynch and Srull (1982), however, point out that this measure is valid only if both momentary effort and time spent processing are measured on ratio scales. While time spent processing may be assumed to have ratio properties, most measures of momentary capacity may not be assumed to have ratio properties.

Another problem with using average response latency as an index of total effort when time allocated to primary task trials varies is that response latencies often decrease dramatically during the course of a trial (Moore, 1984). Therefore, the more time that is allocated to a primary task trial, the greater the likelihood that average response latency will underestimate the total effort required by the primary task.

Because the current study is concerned with total effort required to evaluate a product description, a secondary task which could provide a good measure of total effort was needed. A recall task seemed most promising. Many theorists consider the limited capacity of short term or working memory to be synonymous with processing capacity (Kahneman, 1973; Hunt, 1978). Maintaining items in short term memory is viewed as an attentional process which competes for capacity with all other attentional processes. A number of studies have shown that recall tasks make demands on overall processing capability, as reflected by performance on a variety of secondary tasks (Baddeley & Hitch, 1974; Johnston, Griffith, & Wagstaff, 1972; Martin, 1970; Murdock, 1965). Therefore it seemed a reasonable assumption that a recall task could also function as a secondary task which would reflect total effort required to form a product evaluation. Recall was expected to be poorer, the greater the total amount of processing which has intervened between the presentation of the memory preload and the time of recall.

A recall measure of cognitive effort was developed. To facilitate the use of this measure, the product evaluation task was administered by a microcomputer. Product descriptions were displayed on the screen and evaluations were entered using the keyboard. Prior to the presentation of each product description, subjects were shown a string of letters chosen randomly without replacement. They were told that the letters were the catalog code for the following product. The letters were displayed for two seconds, then the product description was presented. As soon as subjects indicated their evaluations, they were asked to recall the catalog code. Number of letters correctly recalled was recorded. Response times for judgments were also recorded.

Contrary to expectation, pilot work indicated that recall did not vary as a function of the processing requirements of the product evaluation task. A number of possible manipulations of primary task processing requirements were examined. For example, the recall performance of subjects who evaluated one-attribute descriptions in a one-attribute context was compared to the recall performance of subjects who evaluated two-attribute descriptions in a two-attribute context. It was expected that the processing demands of the two-attribute description would be greater. The two-attribute description contained more information than the one-attribute description (it contained identical information to the one-attribute description, plus information about an additional attribute). Therefore, as long as it may be assumed that subjects evaluating the one-attribute description did not think about missing attributes, greater effort should be required to evaluate the two-attribute description. Based on previous results of this series of studies, it is unlikely that subjects who evaluated the one-attribute description in a one-attribute context did think about other attributes.

Neither this nor other manipulations of product evaluation processing demands had any effect on recall performance. Although it is not clear why this occurred, the recall task may have been too intrinsically interesting for subjects to treat it as a secondary task.

It was found, however, that the time required to form a product evaluation was greater when processing demands were greater. It appeared that subjects handled increased processing requirements by simply taking longer to make evaluations. Therefore, it was decided that response times to form evaluations could serve as an index of the processing demands of the product evaluation task. This was the cognitive effort measure employed in the following study.

Method

Subjects

Subjects were 200 undergraduate psychology students who participated in partial fullfilment of a course requirement.

Materials

Product descriptions. For the most part, product descriptions were identical to those used in previous experiments. As was done in Experiment III, the total number of product descriptions in the one-attribute context was increased from eight to 12. (The four additional descriptions which were required for each attribute are in Appendix VI). This made the total number of evaluations made in one- and two-attribute contexts identical, thus decreasing the probability that differences in processing loads would cause differences in processing strategies between contexts.

Product sets employed in the two-attribute contexts were identical to the two-attribute consistent (attribute correlations consistent with expectations) product sets employed in Experiment II.

Service descriptions. In order to establish common endpoints for the response scale in all information contexts, subjects in each context again rated a set of evaluatively extreme refrigerator rental services and carpet cleaning services.

Index cards. Each service description and each product description was printed on a index card for presentation during the retrospective comments portion of the task.

Design

Product class was a within subjects factor. Each subject evaluated a set of refrigerators and a set of carpet cleaners. Within each product class, there were nine different information contexts. Five of the contexts were one-attribute contexts, in which all alternatives were described in terms of only one attribute. Four of the contexts were two-attribute contexts, in which most alternatives were described in terms of two attributes.

Information context within a product class was varied between subjects, so that each subject was exposed to only one context for each product class. For every subject, alternatives for one product class were presented in a one-attribute context, while alternatives for the other product class were presented in a two-attribute context. Order of information contexts was counterbalanced across subjects so that every context appeared first once and second once for each context with which it was paired.

Attractiveness of test descriptions was varied within subjects across four levels (very unattractive, moderately unattractive, moderately attractive, and very attractive).

Each subject evaluated each description twice, for a total of 48 separate product evaluations. Test descriptions always appeared in positions three, six, nine, and twelve. Within these positions, the order of the test descriptions was counterbalanced. The counterbalancing scheme was the same as in Experiment III, and was illustrated earlier in Table 8-1.

In order to reduce the sample size required to run the experiment, the design allowed only five comparisons between the one-attribute context and the two-attribute context in each product class. In contrast, there were eight such comparisons in Experiments I and II. Table 9-1 illustrates the comparisons which were retained. All of the

Table 9-1
Information Context Comparisons

	Two-Attribute Contexts: Refrigerators			
One-Attribute Context: Refrigerators	Capacity & Warranty	Capacity & Shelf Space	Capacity & Energy Cost	Capacity & Price
Capacity	x*	x	x	x
Price				x

	Two-Attribute Contexts: Carpet Cleaners			
One-Attribute Context: Carpet Cleaners	Area cleaned & vers.	Area cleaned & tank cap.	Area cleaned & weight	Area cleaned & price
Area cleaned	x	x	x	x
Price	x			x

* x indicates comparisons of one- and two-attribute contexts included in the design

comparisons involving the known attribute capacity in the refrigerator product class and area cleaned in the carpet cleaner product class were retained. Because evidence from previous studies had suggested that price is different from other attributes in its propensity to prompt inferences in the one-attribute context, comparisons involving the known attribute price were also retained in each product class.

Comparisons involving the three remaining attributes in each product class (warranty, shelf space, and energy cost for refrigerators and versatility, tank capacity, and weight for carpet cleaners) were eliminated. Test descriptions containing information about each of these attributes still appeared in the one-attribute context, but not in the two-attribute context. Evaluations of these test descriptions were not included in the product evaluation analyses, although retrospective comments for these descriptions were examined to gain further insight into how simple product descriptions are evaluated.

Dependent Variables

Product evaluations. Product descriptions were rated on a 7-point scale from -3 (very unattractive) to +3 (very attractive).

Response latencies. The amount of time required to evaluate each product description was recorded.

Retrospective comments. After completing the product evaluation task, subjects were asked to recall the thought processes involved in evaluating each of the product descriptions. These retrospective comments were tape recorded.

Procedure

Subjects were administered the procedure individually. After the experimenter gave a general description of the procedure, subjects received detailed task instructions and actually performed the rating task on a microcomputer. The task instructions were virtually identical to those from the earlier experiments, with the addition of instructions for using the computer.

Subjects rated the products and services by pushing one of six specially labeled rating keys. Prior to each product evaluation trial, an X was displayed on the sceen in the position in which the product description would appear. Subjects were instructed to position their fingers over the rating keys, focus on the X, and then to press the space bar to indicate that they were ready for the next product description. When the space bar was pressed, the product description was displayed and remained on the screen until one of the rating keys was pressed. Subjects were instructed to make their ratings as quickly as possible while still making thoughtful evaluations. Elapsed time between display of the product description and depression of one of the rating keys was recorded.

Before beginning the actual product evaluation trials, subjects were given a set of practice trials. If a subject appeared to be having trouble with the use of the keyboard or if response times were considerably above or below average, the experimenter intervened, giving additional instructions. Subjects were required to repeat the practice trials until performance was satisfactory.

The overall sequence of events for the product evaluation task was as follows: Subjects read task instructions and performed practice rating trials until performance was satisfactory. Then trials for the first product class for that subject began. First, the four services were rated. Next, the general product description for the product class was presented to be read. Then the 12 product descriptions for that information context were rated. Then all 12 product descriptions were rated a second time. Finally, the services were rated a second time. Then trials for the second product class began. The sequence of events was the same as for the first product class.

Following the product rating task, subjects were asked to provide retrospective comments about the product evaluation process. As a warm-up task, subjects were first asked to describe how they evaluated one or more of the services. Once the experimenter judged that the subject understood the task, the actual product descriptions were presented. Both service and product descriptions were presented on individual index cards which were placed on the table in front of the subject. Experimenters gave nondirective prompts to encourage verbalization, such as "was there anything else you thought about?" or "did you have any other thoughts?" Retrospective comments were tape recorded for later coding.

Results

Response Time Analysis

It was hypothesized that the cognitive effort required to evaluate the test descriptions would be greater in the two-attribute context than in the one-attribute context. This is because noticing a missing attribute, which is more likely to occur in the two-attribute context, is proposed to be an attention-consuming process. Therefore, it was predicted that response latencies would be greater in the two-attribute context than in the one-attribute context. This hypothesis was supported.

Subjects evaluated each product description twice. In order to reduce error variance due to with extremely long or short response times which are unrelated to treatment conditions (subjects accidentally hitting a response key or having difficulty finding a response key, for example), the dependent variable in the following analyses was each subject's average response latency for each product description.

The order of presentation of the different attractiveness levels of the known attributes was counterbalanced. In order to interpret unambiguously the following planned comparisons, the possibility that order or position effects were responsible for the observed differences must be considered. This analysis is presented in Appendix VI and indicated no problems for the interpretation of the planned comparisons.

The planned comparisons are in Tables 9-2 and 9-3 for refrigerators and carpet cleaners, respectively. Summary tables for these comparisons are in Appendix VI. In nine of the ten comparisons, the average response time was significantly greater in the two-attribute context than in the one-attribute context, as predicted. In the other comparison, it was marginally significant in the predicted direction. On the average, it took about 1.5 seconds longer to evaluate the test descriptions in the two-attribute context. It

Table 9-2
Planned Comparisons for Response Latencies
Refrigerators

Known Attribute	Missing Attribute (Two-Attribute Context)	Means One-Attribute Context	 Two-Attribute Context	*F*	*p*
Capacity	Warranty	123.29	239.62	18.76*	.0001
Capacity	Shelf space	123.29	197.26	15.48*	.0004
Capacity	Energy cost	123.29	225.88	31.32*	.0001
Capacity	Price	123.29	253.98	41.26*	.0001
Price	Capacity	144.43	225.83	4.23*	.0478

**p* < .05

Note: Response latency units = 1/60 second

Table 9-3
Planned Comparisons for Response Latencies
Carpet Cleaners

Known Attribute	Missing Attribute (Two-Attribute Context)	Means One-Attribute Context	 Two-Attribute Context	*F*	*p*
Area cleaned	Versatility	207.57	295.98	10.33*	.0030
Area cleaned	Tank capacity	207.57	299.26	8.33*	.0069
Area cleaned	Weight	207.57	288.84	9.51*	.0042
Area cleaned	Price	207.57	343.68	21.61*	.0001
Price	Area cleaned	152.07	205.55	3.52	.0697

**p* < .05

Note: Response latency units = 1/60 second may therefore be concluded that noticing missing information is an effortful, attention-consuming process.

Recall that in two cases, when refrigerator capacity is known and warranty or shelf space is missing, subjects have been more likely to make inferences in the two-attribute context, typically inferring the refrigerator to have no warranty or no shelves. It might be expected these inferences would increase the effort required to evaluate these descriptions. No such pattern is evident in the data, however. Perhaps inferring that an attribute is absent is not particularly effortful.

It is also useful to compare the cognitive effort required to evaluate the test descriptions in the two-attribute context with the effort required to evaluate two-attribute descriptions in the same context. Under the original hypothesis that inferences would be made in the two-attribute context, it was thought likely that it would actually take more effort to evaluate the one-attribute test descriptions than to evaluate two-attribute descriptions. If the effort required to make an inference about the missing attribute were greater than the effort required to read and comprehend information about the same attribute, then it would be expected that this would be true.

Although evidence indicates that subjects are not frequently making inferences as originally predicted, noticing missing attibutes increases the effort required to evaluate a description. If it were to take longer to evaluate one-attribute test descriptions in the two-attribute context than to evaluate two-attribute descriptions, this would suggest that some relatively complex processing is occurring in response to missing information, even though such processing does not include making an inference about the missing attribute. Therefore the response time required to evaluate the test descriptions in the two-attribute context was compared to the effort required to evaluate two-attribute descriptions.

These planned comparisons are in Tables 9-4 and 9-5 for refrigerators and carpet cleaners, respectively. Summary tables for these comparisons are in Appendix VI. The time required to evaluate the two-attribute descriptions was significantly greater than the time required to evaluate the one-attribute test descriptions in five of the ten cases tested. All differences in means were in the same direction. Although noticing missing information is an effortful activity, it is not as effortful as processing available information. This suggests that the processing which occurs in response to missing information is probably not very complex or elaborate.

Product Evaluations

Product evaluations were analyzed to determine if they exhibited patterns similar to those observed in the previous experiments. The effects of interest are the main effect of context and the linear trend component of the context x attractiveness of the known attribute interaction. It was expected that there would be a main effect of context, with evaluations in the two-attribute context being less favorable than evaluations in the one-attribute context. It was also expected that there would be a significant difference in linear trend between the two contexts. If evaluations are plotted as a function of the attractiveness of the known attribute, it was expected that the slope of this line would be less steep in the two-attribute context,

Table 9-4
Planned Comparisons for Response Latencies
Refrigerators

		Means			
Known Attribute	Missing Attribute	One-Attribute Description	Two-Attribute Description	F	p
Capacity	Warranty	239.62	267.33	3.93	.0620
Capacity	Shelf space	197.26	264.56	21.92*	.0002
Capacity	Energy cost	225.88	306.87	45.52*	.0001
Capacity	Price	253.98	274.44	1.04	.3198
Price	Capacity	225.83	322.23	18.25*	.0004

*p < .05

Note: Response latency units = 1/60 second

Table 9-5
Planned Comparisons for Response Latencies
Carpet Cleaners

		Means			
Known Attribute	Missing Attribute	One-Attribute Description	Two-Attribute Description	F	p
Area cleaned	Versatility	295.98	317.11	1.71	.2063
Area cleaned	Tank capacity	299.26	349.18	4.97*	.0381
Area cleaned	Weight	288.84	315.33	2.34	.1428
Area cleaned	Price	343.68	375.18	2.87	.1064
Price	Area cleaned	205.55	329.14	42.22*	.0001

*p < .05

Note: Response latency units = 1/60 second suggesting that the effect of varying the attractiveness of the known attribute is less in this context. These predictions were generally supported, although the tendency to evaluate descriptions less favorably in the two-attribute context does not appear to be as robust as previously thought.

The order of presentation of the different attractiveness levels of the known attributes was counterbalanced. In order to interpret unambiguously the following planned comparisons, the possibility that order or position effects were responsible for the observed differences must be considered. This analysis is presented in Appendix VI and indicated no problems for the interpretation of the planned comparisons.

Main effect of context. Planned comparisons are in Table 9-6 and 9-7 for refrigerators and carpet cleaners, respectively. Summary tables for these comparisons are in Appendix VI. Although means were lower in the two-attribute context in six of the ten cases tested, the effect was significant in only three cases. Contrary to prediction, evaluations based on carpet cleaner area cleaned tended to be more favorable in the two-attribute context, although this effect was significant in only one of these four comparisons. In Experiment II, evaluations based on carpet cleaner area cleaned also tended to be more favorable in the two-attribute context.

It has been suggested that the tendency for evaluations to be lower in the two-attribute context may reflect a tendency to penalize incompletely described alternatives rather than a tendency to make negative inferences about missing attributes, as originally hypothesized. This suggestion was based on the evidence that the overall incidence of inference making is not higher in the

Table 9-6
Context Main Effect for Refrigerators

Known Attribute	Missing Attribute (Two-attribute Context)	Test Description Means One-Attribute Context	 Two-Attribute Context	F	p
Capacity	Warranty	.21	-.87	17.35*	.0002
Capacity	Shelf space	.21	-.61	14.11*	.0007
Capacity	Energy cost	.21	.09	.27	.6044
Capacity	Price	.21	-.16	2.77	.1058
Price	Capacity	-.09	-.44	1.43	.2399

*p < .05

Table 9-7
Context Main Effect for Carpet Cleaners

Known Attribute	Missing Attribute (Two-attribute Context)	Test Description Means One-Attribute Context	 Two-Attribute Context	F	p
Area cleaned	Versatility	.24	.52	1.84	.1840
Area cleaned	Tank capacity	.24	.23	0.00	.9755
Area cleaned	Weight	.24	.31	.13	.7164
Area cleaned	Price	.24	.69	4.26*	.0472
Price	Area cleaned	-.11	-.84	5.47*	.0258

*p < .05

two-attribute context than in the one-attribute context. Given that evaluations are not always less favorable in the two-attribute context, however, this explanation does not appear to be entirely correct. The tendency for evaluations to be lower in the two-attribute context may be a function of the type of information that is available, although it is not immediately clear what it is about the area cleaned attribute that is different from other attributes examined.

Context x linear trend. Evaluations are plotted as a function of the attractiveness of the known attribute in Figures 9-1 through 9-4. There again appears to be a general tendency for the slope in the two-attribute context to be less steep than in the one-attribute context. Planned comparisons are in Tables 9-8 and 9-9 for refrigerators and carpet cleaners, respectively. Summary tables for these comparisons are in Appendix VI. The slope was significantly less steep in the two-attribute context in six of the ten cases tested, and the difference was marginally significant in the predicted direction in one other case.

Summary. Patterns in evaluations were generally consistent with those observed in previous studies. These results may be taken as evidence that the somewhat different procedure in this study, specifically, the use of the microcomputer and the instructions to work quickly, did not substantially alter the observed process.

Retrospective Comments

Retrospective comments were examined to see if they exhibited patterns similar to those in previous studies. Retrospective comments were coded for the incidence of mentioning an attribute not contained

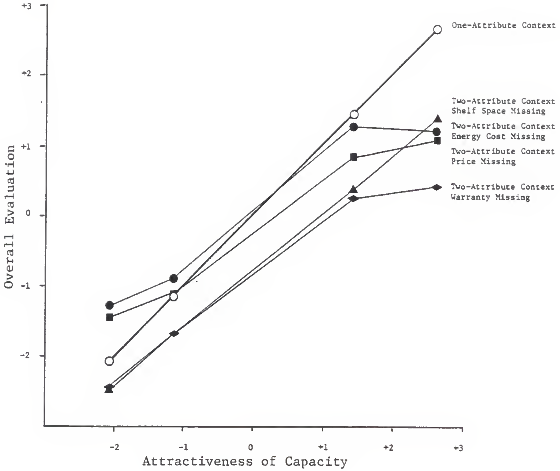

Figure 9-1
Refrigerator Evaluations
Based on Information about Capacity

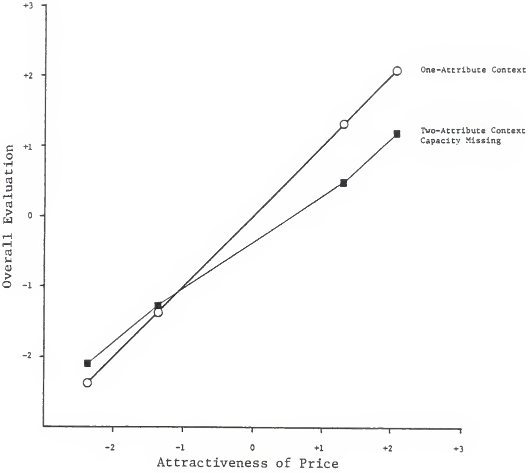

Figure 9-2
Refrigerator Evaluations
Based on Information about Price

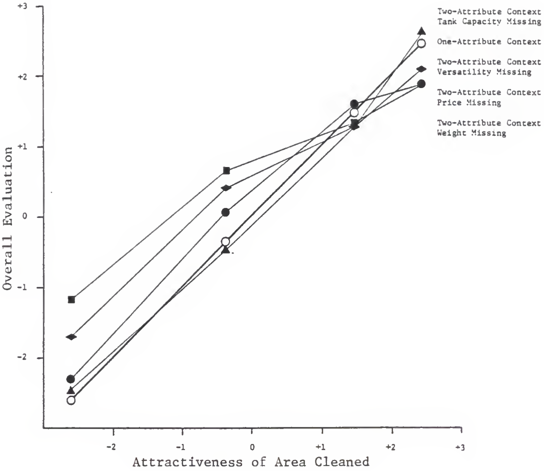

Figure 9-3
Carpet Cleaner Evaluations
Based on Information about Area Cleaned

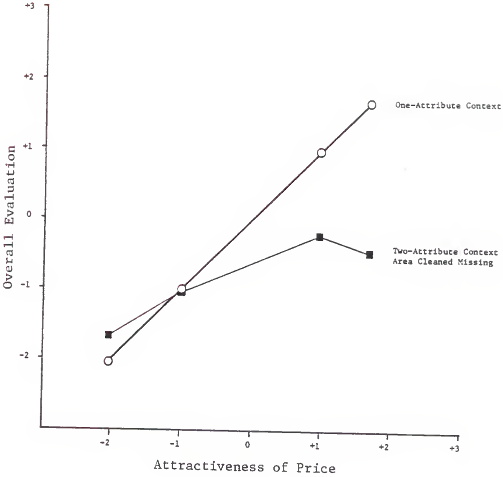

Figure 9-4
Refrigerator Evaluations
Based on Information about Price

Table 9-8
Differences in Linear Trend Between Contexts
Refrigerators

Known Attribute	Missing Attribute (Two-Attribute Context)	*F*	*p*
Capacity	Warranty	11.60*	.0018
Capacity	Shelf space	1.73	.1974
Capacity	Energy cost	12.79*	.0011
Capacity	Price	5.60*	.0242
Price	Capacity	3.03	.0916

*$p < .05$

Table 9-9
Differences in Linear Trend Between Contexts
Carpet Cleaners

Known Attribute	Missing Attribute (Two-attribute Context)	*F*	*p*
Area cleaned	Versatility	4.96*	.0332
Area cleaned	Tank capacity	.02	.8883
Area cleaned	Weight	1.28	.2658
Area cleaned	Price	10.97*	.0023
Price	Area cleaned	6.91*	.0131

*$p < .05$

in the description and of making an inference about such attributes. If a subject explicitly stated an assumed value for a missing attribute or stated the expected relationship between a known and missing attribute, an inference was coded as having been made. Coding was completed by an experienced coder.

It was predicted that the incidence of mentioning missing attributes would be higher in the two-attribute context than in the one-attribute context. It was also predicted that there would either be no difference in the incidence of inference making between contexts, or that the incidence of inference making would actually be lower in the two-attribute context. These predictions were generally supported.

Significance tests. Proportions of subjects mentioning or inferring a missing attribute are reported in Table 9-10. Proportions were tranformed into logits and analyzed via a weighted least squares analysis with information context (one-attribute and two-attribute) as a between subjects factor and attractiveness of the known attribute (very unattractive, moderately unattractive, moderately attractive, and very attractive) as a within subjects factor. The test statistic is a Wald (1943) chi square statistic. Although the order in which retrospective comments was requested was counterbalanced, sample sizes were too small to include order and position in the model.

The analysis for the dependent variable mentioning a missing attribute is reported in Tables 9-11 and 9-12 for refrigerators and carpet cleaners, respectively. As predicted, there was a significant main effect of context, with the incidence of mentioning a missing

Table 9-10
Proportions of Subjects Mentioning and Inferring Missing Attributes

Product Class	Mentions		Inferences	
	One-Attribute Context	Two-Attribute Context	One-Attribute Context	Two-Attribute Context
Refrigerators	.24	.65	.16	.27
Carpet Cleaners	.21	.58	.16	.18

Table 9-11
Significance Tests
Proportion of Subjects Mentioning a Missing Attribute
Refrigerators

Source	*df*	Chi square	*p*
Between			
Context	1	48.96*	.0001
Within			
Attractiveness	3	8.17*	.0427
Attractiveness x context	3	1.85	.6034

*$p < .05$

Table 9-12
Significance Tests
Proportion of Subjects Mentioning a Missing Attribute
Carpet Cleaners

Source	*df*	Chi square	*p*
Between			
Context	1	39.27*	.0001
Within			
Attractiveness	3	11.61*	.0089
Attractiveness x context	3	3.01	.3902

*$p < .05$

attribute being higher in the two-attribute context for both product classes.

There was also a significant main effect of attractiveness of the known attribute for both product classes. Pairwise comparisons of proportions for each attractiveness level are in Table 9-13 and 9-14 for refrigerators and carpet cleaners, respectively. An alpha level of .008 (.05/6) was adopted for these comparisons. The proportions were .43, .39, .48, and .48 for the very unattractive, moderately unattractive, moderately attractive, and very attractive refrigerators, respectively. Only the difference between the moderately unattractive and the moderately attractive proportions was significant.

The proportions were .37, .32 .43, and .46 for the very unattractive, moderately unattractive, moderately attractive, and very attractive carpet cleaners, respectively. The proportion for the moderately unattractive description was significantly lower than the proportions for the moderately attractive and the very attractive descriptions. These results were similar to those for refrigerators. It is not obvious why such effects may have occurred.

The analyses for the dependent variable inferring a missing attribute are in Tables 9-15 and 9-16 for refrigerators and carpet cleaners, respectively. As predicted, there was no difference in the incidence of making inferences about missing attributes between contexts in either product class.

Comparisons by known and missing attribute combination. As in previous studies, the proportion of subjects mentioning and inferring missing attributes was calculated separately for each known and

Table 9-13
Pairwise Comparisons of Attractiveness Means
Proportion of Subjects Mentioning a Missing Attribute
Refrigerators

Comparison	*df*	Chi Square	*p*
Very Unattractive & Moderately Unattractive	1	1.46	.2262
Very Unattractive & Moderately Attractive	1	2.04	.1529
Very Unattractive & Very Attractive	1	1.96	.1615
Moderately Unattractive & Moderately Attractive	1	7.18*	.0074
Moderately Unattractive & Very Attractive	1	6.56	.0105
Moderately Attractive & Very Attractive	1	0.00	1.0000

*$p < .008$

Table 9-14
Pairwise Comparisons of Attractiveness Means
Proportion of Subjects Mentioning a Missing Attribute
Refrigerators

Comparison	*df*	Chi Square	*p*
Very Unattractive & Moderately Unattractive	1	1.50	.2212
Very Unattractive & Moderately Attractive	1	2.85	.0912
Very Unattractive & Very Attractive	1	5.58	.0182
Moderately Unattractive & Moderately Attractive	1	7.65*	.0057
Moderately Unattractive & Very Attractive	1	11.92*	.0006
Moderately Attractive & Very Attractive	1	.66	.4182

*$p < .008$

Table 9-15
Significance Tests
Proportion of Subjects Inferring a Missing Attribute
Refrigerators

Source	*df*	Chi square	*p*
Between			
Context	1	2.25	.1336
Within			
Attractiveness	3	4.30	.2305
Attractiveness x context	3	.95	.8139

Table 9-16
Significance Tests
Proportion of Subjects Inferring a Missing Attribute
Carpet Cleaners

Source	*df*	Chi square	*p*
Between			
Context	1	.01	.9410
Within			
Attractiveness	3	2.23	.5270
Attractiveness x context	3	.92	.8216

missing attribute combination. Attributes mentioned or inferred were further classified as test or other attributes. For a given known and missing attribute combination, the test attribute is the attribute which is missing in the two-attribute context.

For the dependent variable incidence of mentioning a missing attribute, these data are in Tables 9-17 and 9-18 for refrigerators and carpet cleaners, respectively. In both product classes, there was a clear tendency for the incidence of mentioning missing attributes to be higher in the two-attribute context for all known and missing attribute combinations. There also was a tendency for the likelihood of mentioning test attributes to increase in the two-attribute context, while the incidence of mentioning other attributes decreased in the two-attribute context. Again, the retrospective comments are consistent with the prediction that the missing attribute captures attention that would otherwise be allocated to elaboratively processing the known attribute.

The data for the dependent variable making an inference about a missing attribute are in Tables 9-19 and 9-20 for refrigerators and carpet cleaners, respectively. As was true in Experiment II, there appears to be a slight increase in inference making in the two-attribute context for most known and missing attribute combinations, and the increase is quite large for evaluations based on refrigerator capacity when warranty or shelf space is missing. Also as in Experiment II, these subjects generally inferred that refrigerators for which no warranty information was given had no warranty, and that refrigerators for which no descriptions of shelves was given had no shelves. The impact of these negative inferences on

Table 9-17
Proportions of Subjects Mentioning Missing Attributes
Refrigerators

Known Attribute	Missing Attribute (Two-Attribute Context)	One-Attribute Context			Two-Attribute Context		
		Test	Other	Total	Test	Other	Total
Capacity	Warranty	0.00	.25	.25	.95	.04	.99
Capacity	Shelf space	.04	.21	.25	.63	0.00	.63
Capacity	Energy cost	.03	.23	.25	.56	.05	.61
Capacity	Price	.08	.18	.25	.50	.01	.51
Price	Capacity	.04	.20	.24	.55	.04	.59

Table 9-18
Proportions of Subjects Mentioning Missing Attributes
Carpet Cleaners

Known Attribute	Missing Attribute (Two-Attribute Context)	One-Attribute Context			Two-Attribute Context		
		Test	Other	Total	Test	Other	Total
Area cl.	Versatility	0.00	.08	.08	.60	.03	.63
Area cl.	Tank capacity	0.00	.08	.08	.38	.01	.39
Area cl.	Weight	.04	.04	.08	.56	.06	.63
Area cl.	Price	.01	.06	.08	.66	.06	.73
Price	Area cleaned	0.00	.30	.30	.46	.24	.70

Table 9-19
Proportions of Subjects Inferring Missing Attributes
Refrigerators

Known Attribute	Missing Attribute (Two-Attribute Context)	One-Attribute Context			Two-Attribute Context		
		Test	Other	Total	Test	Other	Total
Capacity	Warranty	0.00	.11	.11	.75	.03	.78
Capacity	Shelf space	.01	.10	.11	.39	0.00	.39
Capacity	Energy cost	.03	.09	.11	.09	.04	.13
Capacity	Price	0.00	.11	.11	.03	.01	.04
Price	Capacity	0.00	.09	.09	.10	.03	.13

Table 9-20
Proportions of Subjects Inferring Missing Attributes
Carpet Cleaners

Known Attribute	Missing Attribute (Two-Attribute Context)	One-Attribute Context			Two-Attribute Context		
		Test	Other	Total	Test	Other	Total
Area cl.	Versatility	0.00	.05	.05	.18	.03	.20
Area cl.	Tank capacity	0.00	.05	.05	.20	.01	.21
Area cl.	Weight	.04	.01	.05	.11	.05	.16
Area cl.	Price	0.00	.05	.05	.05	.04	.09
Price	Area cleaned	0.00	.19	.19	.10	.14	.24

evaluations may be seen in Tables 9-4 and 9-5 above. The tendency to evaluate descriptions less favorably in the two-attribute context was greatest for evaluations based on capacity when warranty or shelf space was the missing attribute.

It was noted earlier that the attributes warranty and shelf space are different from all others in these studies in that they are attributes which may be absent. Inferring the absence of an attribute when this is possible appears to be a commonly used inference strategy. The incidence of making inferences about attributes which could not be absent was low.

In both product classes, there was again a shift from making price-quality inferences in the one-attribute context to not making such inferences in the two-attribute context. For refrigerators, the proportion making price-quality inferences in the one-attribute context was .08, and in the two-attribute context was .03. For carpet cleaners, these proportions were .19 and .13.

Summary. The results are consistent with those from previous studies. The two-attribute context increases the incidence of mentioning missing attributes, but has little effect on the incidence of making inferences about missing attributes, except when the missing attribute is one which may be inferred to be absent. The retrospective comments also show evidence of diversion of attention away from attributes which are considered in the one-attribute context and to the missing attribute made salient by the information context manipulation in the two-attribute context. These results may be taken as evidence that the somewhat different procedure employed in this study did not alter the observed processes.

Discussion

The purpose of Experiment IV was to determine if noticing missing information is an attention-consuming process which reduces the cognitive capaicty available for other activities. At least when the missing information is made salient by the context in which it is encountered, this appears to be true. The effort required to evaluate one-attribute test descriptions was greater in the two-attribute context, in which information was typically available about another attribute, than in the one-attribute context, in which information was not typically available about another attribute.

While noticing missing information is an attention-consuming process, it does not appear that missing information fosters an elaborate processing strategy. Noticing missing information requires less effort than processing attribute information when it is available. Although inferences are sometimes made, perhaps the effects of missing information most often are simply to reduce attention to the information provided, and frequently to lower evaluations as a penalty for incompleteness.

The analysis of product evaluations and retrospective comments serves two purposes. First, it provides evidence that the evaluation process was similar in this study in which subjects worked at a microcomputer and were encouraged to work quickly to the process in the previous studies in which subjects simply wrote their evaluations on paper and were not encouraged to work quickly.

Second, it provides further evidence about the process by which these descriptions are evaluated. There is a tendency to evaluate product descriptions less favorably in the two-attribute context, although this effect is not universal. There is a fairly strong tendency for the impact of the known attribute on overall evaluations to be lower in the two-attribute context, suggesting that less attention is paid to known attributes in this context. Finally, retrospective comments provide further evidence that noticing missing attributes made salient by the information context manipulation diverts attention from processing which would otherwise occur.

CHAPTER X
CONCLUSION

Research Summary

Problem

Most previous research examining consumers' use of product information has focused on the relationship between available information and product evaluations or processing strategies. An implicit assumption of much of this research is that the consumer has available information about all relevant attributes for all brands considered. The impetus of the current research was the recognition that the consumer's information processing environment is frequently not characterized by complete brand-attribute information. Rather, consumers often do not have available some product information which they may want to consider. It seemed likely that the absence of desired attribute information may foster processing strategies which are different from those that are implemented when complete information is available, and which may affect evaluation and choice. For this reason, it was decided to examine how consumers respond to missing information.

The research intially focused on inference making as a response to missing information. It has often been suggested that consumers may infer the value of unknown attributes and use these inferences in forming product evaluations. While there is considerable evidence that people are capable of making inferences about unobserved attributes (Dover, 1980; Mazis & Atkinson, 1976; Olson, 1978; Olson & Dover, 1978a, 1978b), there has been little research which can indicate whether such inference processes occur spontaneously.

In order to examine this question, subjects were asked to evaluate products based on limited product information. Evaluations were examined for patterns consistent with what would be expected if inferences were made about missing attributes and incorporated into overall evaluations. Verbal protocols of the evaluation process were also collected, and in one study, a measure of the cognitive effort required to form evaluations was taken. These measures were intended to provide converging evidence that inferences were being spontaneously made as products were evaluated.

Predictions

When are inferences made? Obviously, consumers do not always make inferences about product attributes for which they have no information. In fact, it has been suggested that people are strongly bound by their information environment, rarely considering information which is not readily available, and rarely tansforming it into another form (Slovic, 1972). Most theorists, however, assume that there are a number of factors which increase the likelihood of inference making. It has been suggested, for example, that inferences are more likely to be made when there is a high correlation between a known attribute and the missing attribute, when the missing attribute is relatively important, or when the context calls attention to the missing attribute (Hansen & Zinkham, 1984; Huber & McCann, 1982).

It was this final suggestion which was examined in the current research. It was assumed that consumers are strongly bound by the information context in which they encounter product information. As a result, they are unlikely to think about an attribute for which they have no information unless the context in some way draws attention to the missing attribute. This may occur, for example, when information about the missing attribute is available for some subset of products to be evaluated. Under these circumstances, it was predicted that consumers are not only likely to think about the missing attribute, but are also likely to make an inference about its value.

How are inferences made? Previous evidence about how inferences are made was integrated in a conceptual framework which posited that inferences about missing attributes are based on the best information the consumer has available. The major variables in this framework are the nature of the expected relationship between known attributes and the missing attribute, and the importance of the missing attribute. When the missing attribute is not expected to be correlated with any known attribute, it was predicted that an inference about its value is based on the expected average value of the attribute in the product class. When the missing attribute is expected to be highly correlated with a known attribute, it was predicted that an inference about its value is based on this expected relationship. In either case, the inference was predicted to be somewhat more negative than implied by the expected average value or the expected relationship. This negative bias was posited to increase with the importance of the missing attribute, and was assumed to result from a desire to avoid evaluating an incompletely described product too positively.

Research Design

Information context. In a series of four studies, identical one-attribute test descriptions of refrigerators and carpet cleaners were evaluated in one of two information contexts. In the one-attribute context, all alternatives were described in terms of only one attribute, the attribute contained in the test descriptions. In two-attribute contexts, most alternatives were described in terms of two attributes: the attribute contained in the test descriptions, and one other attribute. Interest focused on evaluations of the test descriptions. In the one-attribute context, it was expected that inferences would rarely be made about missing attributes, and thus that evaluations would reflect only the attractiveness of the known attribute. In the two-attribute context, it was expected that inferences would frequently be made about the missing attribute (for which information was available for a subset of the alternatives), and that these inferences would be incorporated into overall evaluations.

Expected relationships between attributes. Attributes paired in the two-attribute context were chosen so that there was either no expected relationship, an expected positive correlation, or an expected negative correlation between the evaluative implications of the known and missing attributes. This allowed a test of the hypothesis that inferences in response to identical product information vary sytematically as a function of the expected relationship between the known attribute and the missing attribute made salient by the information context.

Attribute importance. Examination of the effects of the importance of the missing attribute was initially deferred, and finally abandoned, as the results of early experiments indicated that inferences were not frequently made about missing attributes as predicted. Instead, successive experiments examined alternative explanations for the low incidence of inference making, and attempted to clarify how subjects did respond to missing information.

Summary of Results

The hypotheses about inference making were generally not supported. There were, however, some fairly consistent effects of information context on product evaluations.

Experiment I. While the information context manipulation clearly focused attention on the missing attribute, inferences were rarely made about these attributes. In general, the predicted systematic differences in evaluations between the one- and two-attribute contexts did not occur. Retrospective comments indicated that while the incidence of mentioning missing attributes was higher in the two-attribute context, there was no difference in the incidence of inference making between contexts. The overall incidence of inference making in all contexts was quite low.

Experiment II. Possible explanations for the low incidence of inference making were examined. The possibility that the factorial manipulation of attribute levels in two-attribute descriptions in Experiment I discouraged the use of expected correlations to make inferences was examined. Product sets in two-attribute contexts were constructed so that attribute correlations were either consistent or inconsistent with expectations.

The possibility that heavy processing loads in Experiment I discouraged elaborative processing such as inference making was indirectly assessed. Processing loads, as indicated by the total number of alternatives to be evaluated by each subject, were reduced. In addition, processing loads in the one- and two-attribute contexts were made more similar (from eight and 48 evaluations in the one- and two-attribute contexts, respectively, to eight and 12 evaluations in the one- and two-attribute contexts, respectively) in order to reduce the probability that heavier processing loads in the two-attribute context discouraged inference making in that context.

Neither of these alternative explanations for the low incidence of inference making appeared to be correct. Subjects were no more likely to make inferences about missing attributes when observed correlations between attributes were consistent with expectations than when they were not. Changes in processing loads did not seem to affect the process either, as Experiment II results essentially replicated those of Experiment I.

Once these alternative explanations for the low incidence of inference making were eliminated, attention focused on understanding exactly how subjects were responding to missing information. In both Experiments I and II, there was a tendency for evaluations in the two-attribute context to be less favorable than evaluations in the one-attribute context. There was also a tendency for the impact of the known attribute on overall evaluations to be lower in the two-attribute context. When evaluations were plotted as a function of the attractiveness of the known attribute, the slope was generally lower in the two-attribute context, implying that increasing the attractiveness of the known attribute has less impact on overall evaluations in this context.

It was possible, however, that the observed effects on product evaluations were artifactual, and did not reflect real differences in evaluations and attentional processes between contexts. Parducci's (1965) range-frequency theory predicts that effects such as between-context differences in evaluations and slopes may result from differences in the use of the response scale by subjects in different contexts rather than from real differences in judgment. Judgments are predicted to be influenced both by the psychological range of evaluations in the set of alternatives being evaluated, as well as by the rank ordering of the alternatives in the set. Because subjects in the one- and two-attribute contexts evaluated different sets of alternatives (only the test descriptions appeared in both contexts), it was likely that there were differences in the psychological range of alternatives evaluated and in the rank ordering of test descriptions in these two contexts. The possibility that such effects could explain observed differences in evaluations of test descriptions was examined. It was concluded that neither effect could account for the observed differences, and therefore that there were real differences in the way products were evaluated in the two contexts.

It was then suggested that lower evaluations in the two-attribute context may have occurred because subjects in this context perceived the test descriptions as being incomplete and were thus less willing to evaluate them positively. This sort of negative bias, which would make it less likely that an incompletely described product would be evaluated too positively, had been predicted for inferences about missing attributes. While negative inferences were sometimes made about missing attributes, evaluations were lower in the two-attribute context even when it did not appear that such inferences were being made. Thus, it appeared that a penalty was applied directly to overall evaluations in these cases.

It was also suggested that the lower impact of the known attribute on overall evaluations in the two-attribute context may have resulted from a diversion of attention away from the known attribute and to the missing attribute. If the missing attribute captures attention ordinarily allocated to the known attribute, it would be expected that the attractiveness of the known attribute would have less influence on overall evaluations.

Experiment III. The interpretation of the results from these experiments relies heavily on the use of retrospective comments. Although evaluations in two-attribute contexts did not vary as a function of the expected relationship between the known and missing attributes as predicted, the inference model does generally predict that evaluations will be lower in the two-attribute context, and that the impact of the known attribute on overall evaluations will be lower in the two-attribute context (except when there is expected to be a positive correlation between the evaluative implications of known and missing attributes).

It was possible, then, that inferences were being made, but that the inference model was incorrect in some details, or that the strength of the expected linear relationship between the known and missing attribute was somewhat different from prediction. Given these possibilities, it was important to determine that the retrospective verbalizations, which indicated a low incidence of inference making, were valid indices of the cognitive processes of interest.

Concerns about the validity of retrospective verbalizations rest on the assumption that the time of verbalization determines the cognitive basis of verbal protocols. The cognitive basis of retrospective verbalizations is information which is no longer available in working memory, and therefore is potentially subject to biases in encoding and retrieval. Particularly if inference making is a well-practiced strategy, the inference processes may simply not be recalled at the time of verbalization.

In contrast, the cognitive basis of concurrent verbalizations is recently processed information which is in working memory and is therefore directly accessible. For this reason, concurrent verbalizations may better indicate the nature of cognitive processes. Although there is some danger that concurrent verbalizations may influence the observed process, this problem can be minimized when instructions are non-directive and do not require intermediate processing of the information to be verbalized, as when subjects are simply instructed to think aloud.

To verify the validity of retrospective verbalizations for the cognitive processes of interest, concurrent verbalizations were collected for a subset of the information contexts employed in Experiments I and II. Both verbalizations and product evaluations were examined. No evidence was found that the retrospective comments were misleading in their characterization of the cognitive processes involved. Therefore it was concluded that the incidence of inference making was indeed low, as had been previously indicated by the retrospective verbalizations. (Though it remains possible that inference making is so automatic that subjects were at no time aware of the process, this research was designed to examine inferences which are made in a deliberate fashion.)

Experiment IV. It had been suggested that noticing the missing attribute is an attention-consuming process which reduces the processing capacity allocated to known information. In Experiment IV, the question of whether noticing missing information is an attention-consuming process was more directly assessed. A response latency measure of cognitive effort indicated that greater effort was required to evaluate one-attribute test descriptions in the two-attribute context than in the one-attribute context. Patterns in evaluations and retrospective comments were essentially identical to those obtained in the previous studies. It was concluded that noticing missing attributes is an attention-consuming process, and therefore that it is likely that noticing missing attributes captures attention that would otherwise be allocated to processing known information.

Meta-analysis. Although there was a general tendency for evaluations to be lower in the two-attribute context and for the impact of the known attribute on overall evaluations to be lower in the two-attribute context, these effects did not always occur, nor were they always statistically significant when they did occur. The question arises of whether these effects occurred at above chance levels. Rosenthal (1982) has described a procedure for jointly interpreting the results from a group of studies. These procedures were applied to the results to Experiments I, II, and IV to determine the probability that these sets of results would have been obtained if the null hypotheses of no effect were true. In addition, effect sizes were estimated based on the combined results of these three studies.

Results for the context main effect are reported in Tables 10-1 and 10-2 for refrigerators and carpet cleaners, respectively. Evaluations in the two-attribute context were significantly less favorable than evaluations in the one-attribute context in 11 of the 16 comparisons. The effect was nonsignificant or significant in the opposite direction to prediction for all four comparisons in which evaluations were based on information about area cleaned. It was also nonsignificant for evaluations based on energy cost when capacity was the missing attribute. Clearly, the tendency for evaluations to be less favorable in the two-attribute context is not universal. This suggests that information context may interact with other factors to determine whether evaluations in the two-attribute context are negatively biased. While it is not obvious what such factors might be, familiarity or the relative importance of the known information may have an effect.

In Tables 10-1 and 10-2, effect sizes are indicated in terms of the adjusted coefficient of determination. The variance accounted for by the context main effect varies considerably. The largest effects are for evaluations based on information about refrigerator capacity when warranty or shelf space is missing. Recall that subjects evaluating these descriptions often made the negative inferences that the refrigerator had no warranty or no shelves. It is likely that these negative inferences are responsible for the large effect sizes. Note, however, that effect sizes are also fairly large for evaluations

Table 10-1
Main Effect of Context
Refrigerator Evaluations

Known Attribute	Missing Attribute (Two-Attribute Context)	Number of Comparisons	Combined Z	p	Average Adjusted R Squared
Capacity	Warranty	3	6.22*	.0001	.41
Capacity	Shelf space	3	5.64*	.0001	.32
Capacity	Energy cost	3	1.71*	.0438	.03
Capacity	Price	3	2.12*	.0170	.07
Warranty	Capacity	2	3.10*	.0010	.13
Shelf space	Capacity	2	2.55*	.0054	.20
Energy cost	Capacity	2	1.10	.1362	0.00
Price	Capacity	3	2.88*	.0020	.09

$^*p < .05$

Table 10-2
Main Effect of Context
Carpet Cleaner Evaluations

Known Attribute	Missing Attribute (Two-Attribute Context)	Number of Comparisons	Combined Z	p	Average Adjusted R Squared
Area cleaned	Versatility	3	-1.94*	.0264	.02
Area cleaned	Tank capacity	3	-.80	.2106	0.00
Area cleaned	Weight	3	-1.08	.1409	.03
Area cleaned	Price	3	-1.55	.0606	.01
Versatility	Area cleaned	2	2.23*	.0129	.19
Tank capacity	Area cleaned	2	3.44*	.0003	.28
Weight	Area cleaned	2	3.07*	.0011	.28
Price	Area cleaned	3	3.53*	.0002	.11

$^*p < .05$

Note: Negative combined Z indicates that the difference in means is in the opposite direction from prediction; evaluations are higher in the one-attribute context than in the two-attribute context.

based on carpet cleaner tank capacity and weight, two attributes for which inference making actually decreased in the two-attribute context.

Other than the possibility that negative inferences increase the effect, these data provide little guidance about factors which may determine the size of the effect. For example, it was hypothesized that the importance of the missing attribute determines the extent to which evaluations in the two-attribute context will be negatively biased. When evaluations based on carpet cleaner area cleaned are examined, however, evaluations in the two-attribute context are not lower, even when an important attribute such as price is missing.

Results for the difference in slope between the one- and two-attribute contexts are summarized in Tables 10-3 and 10-4 for refrigerators and carpet cleaners, respectively. The difference in linear trend was significant in the predicted direction in 13 of the 16 cases tested. Although the effect is not uniformly present, it does occur with considerable frequency.

Effect sizes vary considerably. The effect is quite small for refrigerator evaluations based on capacity when shelf space or warranty is missing, the two cases in which subjects did tend to make inferences in the two-attribute context, but it is also small in many other cases as well. Some effect sizes are relatively large for evaluations based on carpet cleaner area cleaned, suggesting that the attentional processes indicated by differences in slope operate even when there is no negative bias of evaluations in the two-attribute context.

In general, then, the results of the meta-analysis suggest that the observed tendency for evaluations to be lower in the two-attribute

Table 10-3
Differences in Linear Trends Between One- and Two-Attribute Contexts
Refrigerator Evaluations

Known Attribute	Missing Attribute (Two-Attribute Context)	Number of Comparisons	Combined *Z*	*p*	Average Adjusted *R* Squared
Capacity	Warranty	3	2.51*	.0061	.06
Capacity	Shelf space	3	1.13	.1291	.02
Capacity	Energy cost	3	2.13*	.0166	.03
Capacity	Price	3	1.49	.0677	0.00
Warranty	Capacity	2	3.57*	.0002	.33
Shelf space	Capacity	2	4.22*	.0001	.57
Energy cost	Capacity	2	-.11	.4549	.01
Price	Capacity	3	2.96*	.0015	.09

*p < .05

Note: Negative combined *Z* indicates that the difference in slopes is in the opposite direction from prediction; the slope is steeper in the two-attribute context than in the one-attribute context.

Table 10-4
Differences in Linear Trends Between One- and Two-Attribute Contexts
Carpet Cleaner Evaluations

Known Attribute	Missing Attribute (Two-Attribute Context)	Number of Comparisons	Combined *Z*	*p*	Average Adjusted *R* Squared
Area cleaned	Versatility	3	5.10*	.0001	.32
Area cleaned	Tank capacity	3	2.89*	.0019	.10
Area cleaned	Weight	3	3.80*	.0001	.15
Area cleaned	Price	3	5.31*	.0001	.29
Versatility	Area cleaned	2	2.55*	.0054	.20
Tank capacity	Area cleaned	2	3.39*	.0004	.15
Weight	Area cleaned	2	3.72*	.0001	.41
Price	Area cleaned	3	3.02*	.0013	.10

*p < .05

context, and for the impact of the known attribute on overall evaluations to be lower in the two-attribute context, are reliable effects which occur for a variety of product attributes, even though effect sizes are often small.

General Discussion

Inference Making

Incidence of inference making. One major finding of this research is that spontaneously made inferences about missing attributes are not as common a response to incomplete information as has been previously supposed. This does not mean that such inferences are never made; a small proportion of subjects in these studies did make inferences more or less as predicted. Inferences were not made, however, by the majority of the subjects. This implies that inference making (in the limited sense used here--inferring the value of an unknown attribute) may influence evaluations and other cognitive activities involving product information relatively infrequently.

Circumstances under which inferences are made. It was found that when subjects thought about a missing attribute which could logically be absent (shelves, a warranty), it was often inferred that the attribute was absent--that the refrigerator had no shelves or no warranty. This did not occur for attributes which could not logically be absent, such as price, or capacity. It may be that inferences are more likely to be made when it is possible to employ extremely simple inference strategies such as inferring the absence of an attribute.

It was also found that some attributes were relatively more likely to prompt inferences, at least in the one-attribute context. For example, price and warranty sometimes prompted inferences about quality. Such attributes may be strongly linked in memory such that thinking about one prompts thoughts about the other. A high perceived correlation between attributes is not sufficient for this to occur, as most attribute pairs which were perceived to be highly correlated did not exhibit this effect. Attributes that are thought to indicate product quality may be particularly likely to prompt inferences even when the context does not make quality salient. Quality is an attribute about which it is often difficult to obtain objective information. For this reason, consumers may learn to infer quality as the only way to obtain information about this important attribute.

Another factor which seems likely to influence the likelihood of inference making is motivation. Although subjects were instructed to to evaluate the products as they would if they were considering a purchase, there is no reason to expect that their motivation to do so was particularly high. When a person really is considering a purchase, the risk involved in making a poor decision is likely to encourage more extensive processing, which may include making an inference when specific attribute information is not readily available. The data from Experiment III are consistent with the contention that increased motivation increases the likelihood of inference making. The process of concurrently verbalizing thought processes seemed to increase the likelihood of making inferences about price based on refrigerator capacity. It seems probable that inferences are also more likely to be made during a choice process, in which the perceived need to have similar attribute information for each alternative to be evaluated may be higher.

Although the motivation to engage in extensive information processing may have been low in these studies, this does not diminish the importance of the results. Consumers are naturally exposed to marketing communications and other sources of product information at times and in situations in which they may be relatively uninterested in the product. Thus these results may correctly represent consumer information processing as it occurs a large proportion of the time. Since subjects in these studies were required to form evaluations, it may be argued that they were more motivated to process the available information than is often true when consumers are exposed to product information in a natural environment, further supporting the contention that inference making is not a frequently employed response to incomplete information.

How inferences are made. The question of how inferences are made remains. Although this research was designed to examine spontaneous inferences, it was not assumed that there are any differences between spontaneous and prompted inferences. Prompted inferences are of interest because prompting inferences is a technique which a marketer may use to frame the product evaluation problem (Huber and McCann, 1982). Therefore it would be useful to examine how prompted inferences are made, and how they influence subsequent evaluations.

Prompted inferences were collected during the development of the stimulus materials (described in Chapter V), and were found to exhibit the predicted correlations with known attributes. It would be useful to employ the same manipulations of expected relationships between known and missing attributes, while collecting both prompted inferences and subsequent evaluations. Then it would be possible to test the intially proposed model of evaluations which include inferences about missing attributes.

Other Responses to Missing Information

Of particular interest are the responses to missing information which were fairly consistently observed across this set of studies.

Context main effect. Evaluations in the two-attribute context tended to be less favorable than evaluations in the one-attribute context. While this effect did not always occur, it did occur for most known attributes. Because verbal protocols indicated that inferences were not often made about missing attributes in the two-attribute context, this effect was interpreted as a tendency to penalize descriptions which are perceived to be incomplete, rather than as a tendency to make negative inferences about missing attributes. (For some known and missing attribute combinations, however, subjects were likely to make inferences about the missing attributes, and these inferences did tend to be negative. Larger effect sizes for the main effect of context were observed in these cases. It was not possible to determine if the negative inferences simply had a greater impact on evaluations than the tendency to penalize evaluations perceived as incomplete, or if, for these descriptions, both negative inferences and an overall penalty for incompleteness were operating to cause the larger effect sizes.)

Whether any given description will be evaluated less positively when it is perceived as incomplete depends on the attractiveness of the description. This is because there was a context x attractiveness of the known attribute interaction. In general, if the known attribute is sufficiently unattractive, evaluations may be expected to be more, rather than less, favorable in the two-attribute context. Because marketers tend to present only positive information about products, however, it is more likely that a product evaluation will suffer by being perceived as incomplete.

Context x attractiveness interaction. The context x attractiveness of the known attribute interaction indicated that the impact of the known attribute on overall evaluations was less in the two-attribute context. This suggests that the known attribute receives less attention in this context. When the verbal protocols and cognitive effort data are examined, it appears that the two-attribute context affects the processing of the known attribute in two ways.

First, there appears to be a straightforward diversion of attention away from the known attribute and to the missing attribute. Verbal protocols indicate a substantial increase in attention to the missing attribute in the two-attribute context. Some of the attention allocated to the missing attribute may be assumed to come from increased attention to the description as a whole. The total cognitive effort required to evaluate a description is higher in the two-attribute context, indicating that the product descriptions consume more total processing capacity in this context.

There is reason to expect that a portion of the attention captured by the missing attribute is diverted from the known attribute, however. Except at low processing loads, increases in processing capacity generally do not keep pace with increases in demands (Kahneman, 1974).

Therefore, a portion of the processing capacity allocated to the missing attribute is probably diverted from the known attribute. Since the missing attribute is obviously very salient, it is more likely that the less salient known attribute suffers any shortfall in attentional capacity. The evaluation data indicating that the known attribute has a lower impact on overall evaluations in the two-attribute context is consistent with this interpretation.

The second way that processing of the known attribute appears to be affected in the two-attribute context is through the inhibition of thoughts about missing attributes other than the one made salient by the context. This effect was less obvious because it could only occur when the incidence of thinking about missing attributes was relatively high in the one-attribute context. When this was true, however, the incidence of thinking about these missing attributes decreased in two-attribute contexts in which another missing attribute was made salient. For example, subjects often made inferences about the quality of a refrigerator based on information about price in the one-attribute context. These inferences were less likely to be made in the two-attribute context when another missing attribute, refrigerator capacity, was made salient.

This inhibition of thoughts about certain missing attributes may be an example of the part-list cuing effect. In the part-list cuing effect, the provision of a portion of a set of information to be recalled inhibits recall of the remainder of the set.

Rundus (1973) has presented a model of the recall process which explains the part-list cuing effect. It is assumed that items in memory are organized into meaningful groups. The organizing idea used to form groups is assumed to be a retrieval cue for the items. Any attempt to recall items from the group begins with the retrieval cue. The probability of retrieving a given item on a given attempt is assumed to be a function of the relative strength of association of that item to the retrieval cue. Retrieval is assumed to occur with replacement, so that, on any given attempt, it is possible that the retrieved item will be one that has previously been recalled. Retrieval of an item is also assumed to increase the strength of association between that item and the retrieval cue, making it more likely that the same item will be re-retrieved on a subsequent attempt. Attempts to recall items are posited to end when a sufficiently long series of consecutive attempts result in the recall of previously recalled items.

The major implication of this model is that recall of an item lowers the probability of recalling other items associated with the same retrieval cue. Recall of the item strengthens the association between the item and the retrieval cue, increasing the probability that the recalled item will be re-retrieved, and decreasing the probability that some other item will be retrieved. At the same time, recall of an item lowers the probability of recalling other items associated with the same retrieval cue by increasing the probability that attempts to recall will end.

If it is assumed that presenting an item from the group to be recalled strengthens the association between the item and the retrieval cue in the same way that actually recalling the item does, it is predicted that the more items which are presented prior to recall, the less likely it is that non-presented items will be recalled.

In the current case, the set of evaluative criteria which could be used to evaluate the product may be considered to be the set of information to be recalled. The product class probably serves as a retrieval cue for these evaluative criteria. In the one-attribute context, all descriptions contain information about only one attribute. In effect, the subject is provided with one of the set of evaluative criteria which could used in deciding how to evaluate the product. In the two-attribute context, most descriptions contain information about two attributes. Even for the test descriptions, which only contain information about one attribute, the second attribute remains salient. In effect, the subject has been provided with two evaluative criteria to use in evaluating the product. The part-list cuing effect predicts that subjects in the one-attribute context, who are only provided with one evaluative criterion, are more likely to think of other evaluative criteria than are subjects in the two-attribute context, who are provided with two evaluative criteria. Thus, subjects who are only given information about refrigerator price are more likely to think about quality than are subjects who are given information about price and capacity.

These two ways that the processing of the known attribute is affected by the two-attribute context--by diversion of attention to the missing attribute and away from the known attribute, and by inhibiting thoughts about certain missing attributes which would ordinarily be prompted by the known attribute--are identical to two approaches to problem framing discussed by Alba and Chattopodhyay

(1985). The traditional approach to problem framing is to focus attention on certain attributes so that it is those attributes which are most likely to be encoded, or learned. Problem framing by selective focusing of attention on product attributes is essentially what is occuring when attention is diverted from the known attribute to the missing attribute in the two-attribute context.

The second approach to problem framing involves influencing retrieval of previously learned information. Alba and Chattopodhyay found that attribute information provided at the time of retrieval can inhibit recall of nonpresented attribute information. In the current study, evidence suggests that making certain evaluative criteria salient can inhibit the likelihood of thinking about other evaluative criteria, and therefore affect the outcome of evaluations.

An alternative interpretation. The main effect of context was interpreted above as resulting from a penalty applied to overall evaluations, rather than from negative inferences made about missing attributes. The context x attractiveness interaction was interpreted as evidence of a diversion of attention from known information when a missing attribute is made salient by the context. It was not interpreted as the reduction in relative weight which would occur if the known attribute were being averaged in with an inferred value for the missing attribute.

The observed main effect of context and context x attractiveness interaction both would occur, however, if subjects in the two-attribute context made negative inferences and integrated them with known information in accordance with an averaging model. The negative inferences would lower evaluations in that context. If evaluations were plotted as a function of the attractiveness of the known attribute, the slope would be less steep in that context. This would occur because the known attribute would receive less relative weight in the overall evaluation as a result of being averaged in with the known attribute.

This alternative interpretation was orginally rejected because verbal protocols indicated no overall difference in the incidence of inference making between the one- and the two-attribute contexts, and because protocols and cognitive effort data supported the attentional shift explanation. The analyses reported here cannot conclusively eliminate this alternative explanation, however.

Because of small sample sizes, statistical analyses examining reported inference making were collapsed over all known and missing attribute combinations within a product class. While there was no overall difference in the incidence of inference making between the one- and two-attribute contexts, it remains possible that the incidence of inference making was somewhat higher in the two-attribute context for many of the known and missing attribute combinations. When this is true, lower evaluations and a lower impact of the known attribute on overall evaluations are predicted to result from a somewhat negative inference being averaged in with known information in the two-attribute context.

For example, the incidence of inference making was much higher in the two-attribute context for evaluations based on refrigerator capacity when warranty or shelf space was the missing attribute. Subjects tended to make the negative inference that the refrigerator had no warranty or no shelf space. Evaluations may have been lower in the two-attribute context because these negative inferences were averaged in with the known capacity, not because the overall evaluation was penalized for being incomplete. The lower impact of the known attribute on overall evaluations may simply be a byproduct of the information integration process.

By combining data from all four studies reported here, it may be possible to obtain sample sizes sufficiently large to conduct statistical analyses on verbal reports of inferences for each known and missing attribute combination. If increased inference making in the two-attribute context is responsible for the observed effects on evaluations, it would be expected that both lower evaluations and lower impact of the known attribute on overall evaluations would occur only for those attribute combinations for which the incidence of inference making is greater in the two-attribute context.

It is also possible to examine not only the total incidence of inference making in the two contexts, but also the evaluative implications of these inferences. This procedure would allow verification that inferences in the two-attribute context tend to be negative, and would allow examination of a second alternative explanation for the observed main effect of context. Even when there no increase in inference making in the two-attribute context, it is possible that lower evaluations are caused by a shift in the evaluative implications of inferences which are made. Factors which act to make inferences negative, such as attributions about the manipulative intent of the information provider, or a desire to avoid evaluating an incompletely described alternative too positively, may be more likely to operate when the context strongly calls attention to the missing attribute. Such a process could account for less favorable evaluations in the two-attribute context, although not for the slope difference, since inferences would be integrated in with known information in both the one- and two-attribute contexts.

These analyses are planned for the future. If combined sample sizes are not sufficiently large, additional data may be collected. It is expected that these analyses will show that observed effects on evaluations are generally not due to inference making. One line of evidence suggesting this conclusion is that the main effect and context x attractiveness interaction do not always occur in conjuction as would be expected if negative inferences were responsible for both effects. For example, evaluations were not generally lower in the two-attribute context for evaluations based on carpet cleaner area cleaned, although the impact of the known attribute on overall evaluations was reliably less in the two-attribute context. In addition, the context x attractiveness interaction is a reliable effect for most known and missing attribute combinations, even when the proportion of subjects making inferences is actually lower in the two-attribute context. This suggests that inferences are not responsible for the effect. The additional analyses are expected to be a valuable source of evidence for strengthening or clarifying the interpretation of these data, however.

Implications for evaluations and learning. This series of studies began with the concern that product evaluations may be influenced by consideration of attributes for which no information is available. These results suggest that salient missing attributes may affect not only product evaluations, but also the likelihood that the presented product information will be retained.

Consider a simple one-attribute product description. Assume that the attribute information is relatively attractive, since marketers generally emphasize attributes on which their product has a competitive advantage.

If the context in which the product information is encountered does not make missing attributes salient, it is likely that evaluations will be influenced only by the attractive information that is provided. The exception is for attributes which are so strongly linked in memory that thinking about one of them is likely to lead to thoughts of the other. Based on the infrequency with which this occurred, it may be supposed that few attributes are so strongly linked with other attributes. Price, for example, did tend to prompt thoughts of quality, but this tendency was by no means universal.

Therefore, if the information context is unlikely to call attention to missing attributes, emphasizing only one or two attributes on which the product has a competitive advantage may be a good strategy. It is likely that evaluations will reflect the attractiveness of the information that is provided, and there is no reason to expect that there will be any harmful effects on retention of the information.

If the context in which the product information is encountered does make missing attributes salient, then effects on both evaluations and retention of product information may be expected. Although inferences may be made about the missing attribute (perhaps most likely when the missing attribute is one which may be logically be inferred to be absent), this appears to occur infrequently. What is likely to occur is that evaluations will be less favorable than if the missing attribute were not salient. This is because there appears to be a general negative bias in evaluations in this context and because the attractive information which is presented receives less attention than it ordinarily would. This decrease in attention to presented information is also likely to lead to poorer retention of this information.

If the product is described in terms of an attribute which ordinarily prompts inferences about a second attribute, such inferences will be less likely to be made in a context which calls attention to another missing attribute. Depending upon whether the usual inferences are postive or negative, inhibition of the inferences will have a negative or positive effect on evaluations, respectively. Because evaluations tend to be less favorable when the context makes a missing attribute salient, the evaluation may be lower regardless of possible positive effects of inhibiting negative inferences, however. Retention of presented product may be expected to be relatively poor. Not only is attention diverted from the presented information, but the inhibition of inferences results in a decrease in elaborative processing of the presented information.

Thus, the strategy of emphasizing one or two attractive product attributes may not be a good one when the context in which the information will be encountered is likely to make a missing attribute salient. It is likely that evaluations will be lower and retention of product information will be poorer than would otherwise be expected. In making decisions about the provision of product information, the negative effects of providing relatively little information must of course be weighed against the potential negative effects of providing more complete information. When the missing information is quite negative, for example, it may sometimes be a better strategy to omit the negative information.

The major contribution of this research to decisions about the provision of product information is the recognition that it is not sufficient to assume that evaluations will reflect only the attractiveness of the presented information. Nor is it correct to assume that product learning will be uninfluenced by incomplete information. Thus the goal of the marketing communication, whether it is to create an immediate positive impression, or to increase knowledge about the product, must be considered.

Future Research

The suggestive results of this series of studies pose a number of interesting research questions.

Retention of product information. It has been suggested that under some circumstances, the strategy of emphasizing relatively few attractive product attributes may have the unintended effect not only of lowering evaluations, but also of reducing retention of the attractive information which is presented. Effects on retention have not been examined. If retention of presented product information is found to decrease when the context makes missing attributes salient, confidence in the interpretation of the current results would be increased.

Effects on retention are predicted to result from decrements in processing capacity allocated to presented information. If this is correct, it would be expected that variables which affect motivation or opportunity to process information would moderate the effect. To the extent that motivation or opportunity is low, it might be expected that retention of presented information would be even poorer. The missing attribute captures attention which would otherwise be allocated to the presented information. When overall attentional capacity is quite low, there may be very little capacity remaining to allocate to the presented information.

As an example, decrements in attention to presented information may be greater under a processing goal other than product evaluation, since motivation to process information may then be lower. A similar effect may be observed when product information is presented via broadcast rather than print media, because of the inherent lower opportunity to process information with broadcast media.

Problem framing and part-list cuing. It has been suggested that being presented with some evaluative criteria decreases the likelihood of thinking about other evaluative criteria. This conclusion is based on evidence that inferences made in the one-attribute context were less likely to be made in the two-attribute context when another missing attribute was made salient. This hypothesis may be more directly tested by varying the number of evaluative criteria presented and actually measuring the number of evaluative criteria recalled.

The extent to which problem framing can be achieved in this manner may be a function of product familiarity. It may be fairly easy to control the evaluative criteria used by a consumer who is not familiar with the product class, but relatively more difficult to control the evaluative criteria used by a consumer who is highly familiar with the product class. The familiar consumer is likely to have strong associations between the product class and a set of evaluative criteria. It may be more difficult for the presentation of a set of evaluative criteria to inhibit recall of these strongly associated evaluative criteria.

Alba and Chattopodhyay (1985) have suggested that recall of product attributes may sometimes be guided by a product prototype, and that the part-list cuing effect may thus be weakened. This, too, seems more likely to be true for the consumer who is highly familiar with the product class.

Information context manipulation. A strong manipulation of information context was employed in the current series of studies. It would be useful to examine how consumers respond to weaker, but more realistic, manipulations of this variable. Examining packages of competing products in the store may be a realistic situation which closely corresponds to the manipulation employed here, but in most marketing communication situations there is likely to be greater variability in the type and amount of information provided by competitors, as well as temporal delay in exposure to successive sets of attribute information. Wright and Rip (1980) found some problem framing effects of competing messages for a product using desciptions which were somewhat more complex and more heterogeneous than those employed here, but there is a need for more research which examines the boundary conditions of such context effects.

Summary

Most theory and research which has addressed the issue of how consumers respond to incomplete information has concentrated on inference making. The current series of studies indicates that inference making is not as common a response to incomplete information as has been supposed. The incidence of inference making was fairly low. Instead, the major effects of incomplete information were on attentional processes. While inference making remains of interest, the theoretical framework for examining reponses to incomplete information needs to be broadened to include the attentional and memory processes which may often be the major variables affected. By only looking for inferences, we may be overlooking some important effects of limited product information.

APPENDIX I
A MODEL OF JUDGMENTS WHICH INCLUDE INFERENCES ABOUT MISSING ATTRIBUTES

A model of judgments which include inferences about missing attributes is developed below. It is assumed that when inferences are made about a missing attribute, they are integrated with known information to arrive at an overall evaluation. An averaging process is assumed to best describe the information integration function. It is further assumed that the weight given to a cue is a function of three factors: (1) the perceived importance of the attribute to the dimension of judgment, (2) the scale value of the attribute relative to the scale values of other attributes, and (3) the degree of certainty associated with the scale value. The greater the perceived importance of the attribute to the dimension of judgment, the greater the weight associated with the cue is expected to be. The lower the scale value of a cue relative to the scale values of other cues, the greater the weight associated with the cue is expected to be. Finally, the greater the certainty associated with a scale value, the greater the weight given to a cue is expected to be.

The simple averaging model of product evaluation can be written as follows:

$$r_{IJ} = k + \frac{w_0 s_0 + w_I s_{I_i} + w_J s_{J_j}}{w_0 + w_I + w_J} + E_{IJ} \qquad (1)$$

where

r_{IJ} = the evaluation based on attributes I and J

k = a constant to allow for an arbitrary zero

w_0, w_I, w_J = the weights of the initial impression and attributes I and J respectively and are assumed to be constants

s_0, s_I, s_J = the scale values for the initial impression and attributes I and J respectively

E = an additive random variable with zero mean that represents response variability.

The error term, E, will not be included in subsequent restatements of the model, although it is assumed to be present in all observed responses.

The initial impression parameter represents the component of the response that remains constant across all attribute combinations. It is often considered to represent the presumed response in the absence of any attribute information, and may reflect the integration of previously acquired information about the object of judgment, or response dispositions and motivational variables (Anderson, 1974).

The weights w_0, w_I, and w_J are often assumed to reflect the perceived importance of the attribute to the dimension of judgment, and therefore to be constant for each attribute dimension. When the weights given to cues are constant, the averaging model is inherently a linear model, whereas overall evaluations have frequently been found to exhibit systematic nonlinearities (Birnbaum, 1973, 1974; Birnbaum & Stegner, 1976, 1981; Lynch & Cohen, 1978; Lynch, 1979). These nonlinearities can often be accounted for by models which assume that weights are partially a function of scale values.

A configural weight model, proposed by Birnbaum (1974), assumes that weights are affected by relationships among the scale values associated with an object of judgment. (See Anderson, 1974 for an alternative model which assumes that weights are a partially a function of the polarity and direction of scale values.) A scale value obtains greater or lesser weight not by its absolute extremity, but by being the most extreme of the scale values associated with the object. The relative weight given a cue in a simple configural weight model may be given by

$$w^* = \frac{w_I}{\Sigma w} + \omega I \qquad (2)$$

where

w^* = the relative weight given cue I_i

w_I = the original weight given to cue I_i and is independent of scale value

Σw = the sum of the original weights for all cues

I = 1 if the scale value of the cue I_i is the largest in the set, -1 if the scale value of cue I_i is the smallest in the set, and 0 if the scale value of cue I_i is neither the smallest nor the largest

ω = the relative weight added to or subtracted from the cue with the largest or smallest scale value, respectively.

If ω assumes a negative value, greater relative weight will be given to the lowest scale value; if ω assumes a positive value, greater weight will be given to the highest scale value. Therefore this model allows greater weight to be given to relatively unattractive information or to relatively attractive information, but not to both.

While evidence suggests that both extreme and negative information tend to receive greater weight, the effects of negativity appear to be much greater. For this reason, it was assumed that greater weight is given to the lowest scale value in a set. If the simple configural weight model which gives greater weight to less attractive information is incorporated into the simple averaging model, the model of overall evaluation based on two cues may be written

$$r_{IJ} = k + \frac{w_0 s_0 + w_{I_i} s_{I_i} + w_{J_j} s_{J_j}}{w_0 + w_{I_i} + w_{J_j}} + \omega |s_{I_i} - s_{J_j}| \qquad (3)$$

where ω takes on a negative value, giving greater weight to relatively less positive scale values. (If ω assumes a negative value and $s_{I_i} < s_{J_j}$, weight will shift from s_{J_j} to s_{I_i}, the amount of shift given by ω. If $s_{I_i} > s_{J_j}$, weight will shift from s_{I_i} to s_{J_j} in the same amount.)

This model assumes that weight shifts occur only among variable cues; the initial impression is not a candidate for this process. Since the initial impression is expected to be less salient than the cues which are varying, this may be a reasonable assumption. It is possible, however, to allow shifts to and from the initial impression by estimating a value of ω for all possible pairs of cues, including the initial impression.

Equation 3 represents the basic model that is assumed to represent product evaluations when all attributes are known. When an inference is made about a missing attribute, it is assumed that the inferred scale value is integrated in with scale values for known information to arrive at an overall evaluation, but that the inference receives less weight than if the same scale value were based on direct information about the attribute. The model of the evaluation process which allows for lower weights for inferred scale values is given by

$$r_{IJ} = k_{IJ} + \frac{cw_0 s_0 + cw_I s_{I_i} + cw_J s_{J_j}}{cw_0 + cw_I + cw_J} + \omega \left| s_{I_i} - s_{J_j} \right| \qquad (4)$$

where

r_{IJ} = the product evaluation in a context in which only information about attributes I and J is usually available

K_{IJ} = a constant to allow for an arbitrary zero and which may be expected to vary with context (the set of attribute information which is usually available)

w = the weight given to a cue independent of its relationship with other cues in the set, and which is expected to reflect the perceived importance of the associated attribute to the dimension of judgment

c = the certainty associated with the scale value for an attribute; $c = 1$ when the associated cue is presented and $0 < c < 1$ when the associated cue is inferred. It is assumed to be constant for all inferred values.

When an inference is made about attribute I, the inferred scale value is substituted for s_{I_i} in the above model; alternatively, when an inference is made about attribute J, the inferred scale value is substituted for s_{J_j}. Inferred scale values are assumed to be determined by the expected relationship between the known and missing information and the perceived importance of the missing attribute. Inferred scale values are given by

$$s_{I_i}(0) = (e_I)-(fw_I) \tag{5}$$

$$s_{I_i}(J_j) = (e_I(J_j))-(fw_I) \tag{6}$$

where

$s_{I_i}(0)$ = inferred scale value when known and missing attributes are not thought to be highly correlated

$s_{I_i}(J_j)$ = inferred scale value when known and missing attributes are thought to be highly correlated

Details of Equations 5 and 6 are given in Chapter IV.

APPENDIX II
QUESTIONNAIRES

Questionnaire Used in Development of Stimulus Materials

CONSUMER SURVEY

In the following pages you will be asked a variety of questions about a consumer product--how attractive you find the product to be, what you would look for when making a purchase decision, and so forth. Please answer all of these questions to the best of your ability. You may find some of the questions difficult to answer, either because you may not know a great deal about the product or because you will be asked to make some judgments about the product based on very little information. It is important, however, that you answer all of the questions using your best judgment. This information will be used in conducting research to help us understand consumer preferences. Thank you for your cooperation.

Before beginning the survey, please read and sign the following informed consent form:

Participation in this research will not provide any benefits to you other than the knowledge you will gain about how such research is conducted. This procedure should not cause you any discomfort; however, if you wish not to participate in this research for any reason, you are free to withdraw at any time. Of course, you will not receive credit for participation if you choose to withdraw.

There will be no compensation for participation other than 1 hour of research participation credit.

If you agree to participate in this research, please read and sign the following statement:

I have read and I understand the procedure described above. I agree to participate in the procedure and I have received a copy of this description.

Signatures:

-- ----------------
Subject Date

-- ----------------
Witness Date

PART I. ATTRIBUTE ATTRACTIVENESS

A product attribute is a characteristic of a product, such as its price, its color, its durability, etc. On the following page, you will be given some brief descriptions of product attributes. For each attribute description, please indicate how attractive you would rate the product to be on that attribute. Assume that the products are identical in all respects except on the attribute you are rating. Sometimes it will not seem very likely that the products could be the same in every other respect, but please make this assumption so that your attractiveness ratings will reflect your rating of the attribute alone, and not attractiveness of what you imagine the product to be like as a whole.

Circle the number which indicates your rating of the attractiveness of the described attribute, with a 3 indicating "very attractive," a 0 indicating "neither attractive nor unattractive," and a -3 indicating "very unattractive." Your ratings should accurately indicate how much difference there is in the attractiveness of various attribute descriptions. For example, one woman made the following ratings for the attractiveness of various seating capacities for a family car.

PRODUCT: FAMILY CAR

3 = very attractive
0 = neither attractive
nor unattractive
-3 = very unattractive

ATTRIBUTE: SEATING CAPACITY

seats 4 adults	3	2	1	0	-1	-2	-3
seats 2 adults	3	2	1	0	-1	-2	-3
seats 8 adults	3	2	1	0	-1	-2	-3
seats 6 adults	3	2	1	0	-1	-2	-3

For family cars which are identical in every other respect, she evaluates the various seating capacities in the following fashion: "seats 4 adults" and "seats 2 adults" are both moderately unattractive, while "seats 8 adults" is very attractive and "seats 6 adults" is moderately attractive. The difference in the ratings of "seats 4 adults" and "seats 6 adults" is four times as great as the difference between the ratings of "seats 6 adults" and "seats 8 adults," indicating that she thinks that the difference in the attractiveness of "seats 4 adults" and "seats 6 adults" is four times as great as the difference in the attractiveness of "seats 6 adults" and "seats 8 adults."

PRODUCT: REFRIGERATOR

First briefly look over all of the attribute descriptions on this page so that you are familiar with them. Then rate the attractiveness of each attribute description, assuming that the refrigerators are identical in every respect except for the attribute you are rating.

3 = very attractive
0 = neither attractive
nor unattractive
-3 = very unattractive

AVERAGE ENERGY COST							
$6/month average energy cost	3	2	1	0	-1	-2	-3
$12/month average energy cost	3	2	1	0	-1	-2	-3
$20/month average energy cost	3	2	1	0	-1	-2	-3
$2/month average energy cost	3	2	1	0	-1	-2	-3
WARRANTY							
2 months warranty	3	2	1	0	-1	-2	-3
4 months warranty	3	2	1	0	-1	-2	-3
18 months warranty	3	2	1	0	-1	-2	-3
2 years warranty	3	2	1	0	-1	-2	-3
PRICE							
$500 price	3	2	1	0	-1	-2	-3
$1200 price	3	2	1	0	-1	-2	-3
$1600 price	3	2	1	0	-1	-2	-3
$350 price	3	2	1	0	-1	-2	-3
SHELF SPACE							
3 full shelves, 2 door shelves	3	2	1	0	-1	-2	-3
2 full shelves, no door shelves	3	2	1	0	-1	-2	-3
4 full shelves, 3 door shelves	3	2	1	0	-1	-2	-3
1 full shelf, no door shelves	3	2	1	0	-1	-2	-3
REFRIGERATOR CAPACITY							
18 cu. ft. refrigerator capacity	3	2	1	0	-1	-2	-3
6 cu. ft. refrigerator capacity	3	2	1	0	-1	-2	-3
4 cu. ft. refrigerator capacity	3	2	1	0	-1	-2	-3
25 cu. ft. refrigerator capacity	3	2	1	0	-1	-2	-3

PART II. EXPECTATIONS ABOUT UNKNOWN ATTRIBUTES

Sometimes you may not know where a product stands on a given attribute, but you can make a guess based on what you do know about the product. For example, an ad for a family car may not say what its expected gas mileage is. If the ad says that the car only seats 2 adults, however, you might expect that it is small and gets good gas mileage. On the other hand, if the ad only tells the amount of the manufacturer's rebate, you might not have a good idea what kind of gas mileage it gets, since cars with small or large rebates sometimes get poor gas mileage and sometimes get good gas mileage.

On the following pages, you will be asked to make these kinds of judgments--to guess where a product stands on an unknown attribute given information about other attributes. The last page of this questionnaire contains a sample question. Tear this sample question from the back of the questionnaire now so that you can follow along.

In the sample question, the product class is family cars and the unknown attribute is gas mileage. Our sample person's responses to this question are illustrated. First, she is asked how she believes the attributes of seating capacity and rebate amount are normally related to gas mileage in family cars. She thinks that the greater the seating capacity, the lower the gas mileage is likely to be. She doesn't think that there is any consistent relationship between rebate amount and gas mileage.

Second, she is asked to rate the attractiveness of what she imagines the gas mileage to be like, given information about other attributes. When the car seats 6 or 8 adults, she thinks that its gas mileage is likely to be relatively low, and therefore unattractive. When the car seats only 2 or 4 adults, she thinks that the gas mileage is likely to be relatively high, and therefore attractive.

Notice that she is rating the attractiveness of what she imagines the gas mileage to be, not the attractiveness of the seating capacities. In fact, her ratings would be quite different if she were rating the attractiveness of the seating capacitities. Remember that in Part I, she rated "seats 8 adults" as the most attractive seating capacity. Because she believes that the gas mileage of the largest car would be lowest, however, she rates the imagined gas mileage of the 8 adult capacity car as the least attractive. You may find that some of the pairs of the attributes that you are asked about will be related in this way, so that the more attractive the known attribute, the less attractive will be the imagined attribute. When this is true, be very careful in making your ratings.

She does not believe that rebate amount generally tells her anything about the gas mileage, so most of the amounts listed do not lead her to believe that the gas mileage would be particularly attractive or unattractive. She does believe, however, that a car with extremely good gas mileage is not likely to have a large rebate. For this reason, she thinks that a car with a \$1000 rebate will probably not get very good gas mileage. Note that this is an exception to her general rule that rebate amount is not related to gas mileage. When you think that two attributes are not generally related, your ratings of the imagined attribute should be the same except when you think that there is an exception to the rule.

This is only an example of how one person answered this question. Different people will answer these questions in different ways. We are interested in knowing when you think you can predict the unknown attribute based on information about other attributes. For your answers to be accurate, it is equally important for you to say that there is a relationship between attributes when there is, and to say that there is no relationship when, in general, there is not. As in Part I, your ratings should reflect the amount of difference there is in the attractiveness of the imagined attributes.

PRODUCT: REFRIGERATOR
UNKNOWN ATTRIBUTE: PRICE

A. Circle the letter of the best answer.

For most refrigerators, it is generally true that

1. a. the greater the refrigerator capacity, the higher the price
   b. the greater the refrigerator capacity, the lower the price
   c. there is little relationship between refrigerator capacity and price

2. a. the greater the shelf space, the higher the price
   b. the greater the shelf space, the lower the price
   c. there is little relationship between shelf space and price

3. a. the higher the average energy cost, the higher the price
   b. the higher the average energy cost, the lower the price
   c. there is little relationship between average energy cost and price

4. a. the longer the warranty, the higher the price
   b. the longer the warranty, the lower the price
   c. there is little relationship between warranty and price

B. Rate the attractiveness of your best guess about the PRICE of each refrigerator described below. Keep in mind that you are rating the attractiveness of the PRICE alone, not the attractiveness of the information that you are given about the product. Depending on how you think the two attributes are related, the attractiveness of the imagined attribute may be similar to, opposite to, or unrelated to the attractiveness of the known attribute.

3 = very attractive
0 = neither attractive nor unattractive
-3 = very unattractive

What Is Known About Refrigerator	Attractiveness of Imagined PRICE
18 cu. ft. refrigerator capacity	3 2 1 0 -1 -2 -3
6 cu. ft. refrigerator capacity	3 2 1 0 -1 -2 -3
4 cu. ft. refrigerator capacity	3 2 1 0 -1 -2 -3
25 cu. ft. refrigerator capacity	3 2 1 0 -1 -2 -3
3 full shelves, 2 door shelves	3 2 1 0 -1 -2 -3
2 full shelves, no door shelves	3 2 1 0 -1 -2 -3
4 full shelves, 3 door shelves	3 2 1 0 -1 -2 -3
1 full shelf, no door shelves	3 2 1 0 -1 -2 -3
\$6/month average energy cost	3 2 1 0 -1 -2 -3
\$12/month average energy cost	3 2 1 0 -1 -2 -3
\$20/month average energy cost	3 2 1 0 -1 -2 -3
\$2/month average energy cost	3 2 1 0 -1 -2 -3
2 months warranty	3 2 1 0 -1 -2 -3
4 months warranty	3 2 1 0 -1 -2 -3
18 months warranty	3 2 1 0 -1 -2 -3
2 years warranty	3 2 1 0 -1 -2 -3

PRODUCT: REFRIGERATOR
UNKNOWN ATTRIBUTE: REFRIGERATOR CAPACITY

A. Circle the letter of the best answer.

For most refrigerators, it is generally true that

1. a. the higher the price, the greater the refrigerator capacity
   b. the higher the price, the smaller the refrigerator capacity
   c. there is little relationship between price and refrigerator capacity

2. a. the longer the warranty, the greater the refrigerator capacity
   b. the longer the warranty, the smaller the refrigerator capacity
   c. there is little relationship between warranty and refrigerator capacity

3. a. the higher the average energy cost, the greater the refrigerator capacity
   b. the higher the average energy cost, the smaller the refrigerator capacity
   c. there is little relationship between average energy cost and refrigerator capacity

4. a. the greater the shelf space, the greater the refrigerator capacity
   b. the greater the shelf space, the smaller the refrigerator capacity
   c. there is little relationship between shelf space and refrigerator capacity

B. Rate the attractiveness of your best guess about the REFRIGERATOR CAPACITY of each refrigerator described below. Keep in mind that you are rating the attractiveness of the REFRIGERATOR CAPACITY alone, not the attractiveness of the information that you are given about the product. Depending on how you think the two attributes are related, the attractiveness of the imagined attribute may be similar to, opposite to, or unrelated to the attractiveness of the known attribute.

3 = very attractive
0 = neither attractive nor unattractive
-3 = very unattractive

What Is Known About Refrigerator	Attractiveness of Imagined REFRIGERATOR CAPACITY
$500 price	3 2 1 0 -1 -2 -3
$1200 price	3 2 1 0 -1 -2 -3
$1600 price	3 2 1 0 -1 -2 -3
$350 price	3 2 1 0 -1 -2 -3
2 months warranty	3 2 1 0 -1 -2 -3
4 months warranty	3 2 1 0 -1 -2 -3
18 months warranty	3 2 1 0 -1 -2 -3
2 years warranty	3 2 1 0 -1 -2 -3
$6/month average energy cost	3 2 1 0 -1 -2 -3
$12/month average energy cost	3 2 1 0 -1 -2 -3
$20/month average energy cost	3 2 1 0 -1 -2 -3
$2/month average energy cost	3 2 1 0 -1 -2 -3
3 full shelves, 2 door shelves	3 2 1 0 -1 -2 -3
2 full shelves, no door shelves	3 2 1 0 -1 -2 -3
4 full shelves, 3 door shelves	3 2 1 0 -1 -2 -3
1 full shelf, no door shelves	3 2 1 0 -1 -2 -3

PRODUCT: REFRIGERATOR
UNKNOWN ATTRIBUTE: WARRANTY

A. Circle the letter of the best answer.

For most refrigerators, it is generally true that

1. a. the higher the average energy cost, the longer the warranty
   b. the higher the average energy cost, the shorter the warranty
   c. there is little relationship between average energy cost and warranty

2. a. the greater the shelf space, the longer the warranty
   b. the greater the shelf space, the shorter the warranty
   c. there is little relationship between shelf space and warranty

3. a. the greater the refrigerator capacity, the longer the warranty
   b. the greater the refrigerator capacity, the shorter the warranty
   c. there is little relationship between refrigerator capacity and warranty

4. a. the higher the price, the longer the warranty
   b. the higher the price, the shorter the warranty
   c. there is little relationship between price and warranty

B. Rate the attractiveness of your best guess about the WARRANTY of each refrigerator described below. Keep in mind that you are rating the attractiveness of the WARRANTY alone, not the attractiveness of the information that you are given about the product. Depending on how you think the two attributes are related, the attractiveness of the imagined attribute may be similar to, opposite to, or unrelated to the attractiveness of the known attribute.

3 = very attractive
0 = neither attractive nor unattractive
-3 = very unattractive

What Is Known About Refrigerator	Attractiveness of Imagined WARRANTY
$6/month average energy cost	3 2 1 0 -1 -2 -3
$12/month average energy cost	3 2 1 0 -1 -2 -3
$20/month average energy cost	3 2 1 0 -1 -2 -3
$2/month average energy cost	3 2 1 0 -1 -2 -3
3 full shelves, 2 door shelves	3 2 1 0 -1 -2 -3
2 full shelves, no door shelves	3 2 1 0 -1 -2 -3
4 full shelves, 3 door shelves	3 2 1 0 -1 -2 -3
1 full shelf, no door shelves	3 2 1 0 -1 -2 -3
18 cu. ft. refrigerator capacity	3 2 1 0 -1 -2 -3
6 cu. ft. refrigerator capacity	3 2 1 0 -1 -2 -3
4 cu. ft. refrigerator capacity	3 2 1 0 -1 -2 -3
25 cu. ft. refrigerator capacity	3 2 1 0 -1 -2 -3
$500 price	3 2 1 0 -1 -2 -3
$1200 price	3 2 1 0 -1 -2 -3
$1600 price	3 2 1 0 -1 -2 -3
$350 price	3 2 1 0 -1 -2 -3

PRODUCT: REFRIGERATOR
UNKNOWN ATTRIBUTE: AVERAGE ENERGY COST

A. Circle the letter of the best answer.

For most refrigerators, it is generally true that

1. a. the higher the price, the higher the average energy cost
   b. the higher the price, the lower the average energy cost
   c. there is little relationship between price and average energy cost

2. a. the longer the warranty, the higher the average energy cost
   b. the longer the warranty, the lower the average energy cost
   c. there is little relationship between warranty and average energy cost

3. a. the greater the refrigerator capacity, the higher the average energy cost
   b. the greater the refrigerator capacity, the lower the average energy cost
   c. there is little relationship between refrigerator capacity and average energy cost

4. a. the greater the shelf space, the higher the average energy cost
   b. the greater the shelf space, the lower the average energy cost
   c. there is little relationship between shelf space and average energy cost

B. Rate the attractiveness of your best guess about the AVERAGE ENERGY COST of each refrigerator described below. Keep in mind that you are rating the attractiveness of the AVERAGE ENERGY COST alone, not the attractiveness of the information that you are given about the product. Depending on how you think the two attributes are related, the attractiveness of the imagined attribute may be similar to, opposite to, or unrelated to the attractiveness of the known attribute.

3 = very attractive
0 = neither attractive nor unattractive
-3 = very unattractive

What Is Known About Refrigerator	Attractiveness of Imagined AVERAGE ENERGY COST
$500 price	3 2 1 0 -1 -2 -3
$1200 price	3 2 1 0 -1 -2 -3
$1600 price	3 2 1 0 -1 -2 -3
$350 price	3 2 1 0 -1 -2 -3
2 months warranty	3 2 1 0 -1 -2 -3
4 months warranty	3 2 1 0 -1 -2 -3
18 months warranty	3 2 1 0 -1 -2 -3
2 years warranty	3 2 1 0 -1 -2 -3
18 cu. ft. refrigerator capacity	3 2 1 0 -1 -2 -3
6 cu. ft. refrigerator capacity	3 2 1 0 -1 -2 -3
4 cu. ft. refrigerator capacity	3 2 1 0 -1 -2 -3
25 cu. ft. refrigerator capacity	3 2 1 0 -1 -2 -3
3 full shelves, 2 door shelves	3 2 1 0 -1 -2 -3
2 full shelves, no door shelves	3 2 1 0 -1 -2 -3
4 full shelves, 3 door shelves	3 2 1 0 -1 -2 -3
1 full shelf, no door shelves	3 2 1 0 -1 -2 -3

PRODUCT: REFRIGERATOR
UNKNOWN ATTRIBUTE: SHELF SPACE

A. Circle the letter of the best answer.

For most refrigerators, it is generally true that

1. a. the higher the average energy cost, the greater the shelf space
   b. the higher the average energy cost, the smaller the shelf space
   c. there is little relationship between average energy cost and shelf space

2. a. the greater the refrigerator capacity, the greater the shelf space
   b. the greater the refrigerator capacity, the smaller the shelf space
   c. there is little relationship between refrigerator capacity and shelf space

3. a. the higher the price, the greater the shelf space
   b. the higher the price, the smaller the shelf space
   c. there is little relationship between price and shelf space

4. a. the longer the warranty, the greater the shelf space
   b. the longer the warranty, the smaller the shelf space
   c. there is little relationship between warranty and shelf space

B. Rate the attractiveness of your best guess about the SHELF SPACE of each refrigerator described below. Keep in mind that you are rating the attractiveness of the SHELF SPACE alone, not the attractiveness of the information that you are given about the product. Depending on how you think the two attributes are related, the attractiveness of the imagined attribute may be similar to, opposite to, or unrelated to the attractiveness of the known attribute.

3 = very attractive
0 = neither attractive nor unattractive
-3 = very unattractive

What Is Known About Refrigerator	Attractiveness of Imagined SHELF SPACE
$6/month average energy cost	3 2 1 0 -1 -2 -3
$12/month average energy cost	3 2 1 0 -1 -2 -3
$20/month average energy cost	3 2 1 0 -1 -2 -3
$2/month average energy cost	3 2 1 0 -1 -2 -3
18 cu. ft. refrigerator capacity	3 2 1 0 -1 -2 -3
6 cu. ft. refrigerator capacity	3 2 1 0 -1 -2 -3
4 cu. ft. refrigerator capacity	3 2 1 0 -1 -2 -3
25 cu. ft. refrigerator capacity	3 2 1 0 -1 -2 -3
$500 price	3 2 1 0 -1 -2 -3
$1200 price	3 2 1 0 -1 -2 -3
$1600 price	3 2 1 0 -1 -2 -3
$350 price	3 2 1 0 -1 -2 -3
2 months warranty	3 2 1 0 -1 -2 -3
4 months warranty	3 2 1 0 -1 -2 -3
18 months warranty	3 2 1 0 -1 -2 -3
2 years warranty	3 2 1 0 -1 -2 -3

PART III. ATTRIBUTE IMPORTANCE

For each attribute listed below, please indicate how important that attribute would be in your evaluation of the product. If you would pay a lot of attention to the attribute when evaluating the product, then it is relatively important. If you would pay little attention to the attribute, then it is relatively unimportant. Be careful not to confuse importance with desirability. For example, you might think that quick service in a restaurant is very desirable, yet you may pay little attention to speed of service when you are choosing a restaurant because other attributes, such as quality of food or atmosphere, are more important to you. Rate an attribute as high in importance only if you would pay a lot of attention to it when evaluating the product.

As you did in making your attractiveness ratings, try to make your importance ratings reflect the amount of difference there is in the importance of the different attributes although you may, of course, rate some attributes as equal in importance.

Before beginning your importance ratings, briefly look over all of the attributes so that you are familiar with them. Then circle the number which indicates your rating of the importance of each attribute, with 7 indicating "very important" and 1 indicating "not at all important."

7 = very important
1 = not at all important

PRODUCT: REFRIGERATOR

Average energy cost	7 6 5 4 3 2 1
Warranty	7 6 5 4 3 2 1
Price	7 6 5 4 3 2 1
Shelf Space	7 6 5 4 3 2 1
Refrigerator capacity	7 6 5 4 3 2 1

PART IV. CONSUMER INFORMATION

Please answer the following questions about yourself. Your answers will help us in analyzing your responses to the previous questions.

Please indicate how familiar you are with the specified product class. Circle the number corresponding with your degree of knowledge about the product class, with a _7_ indicating "very familiar" and a _1_ indicating "not at all familiar." Also indicate whether you have ever purchased the product by circling "Yes" if you have, or by circling "No" if you have not.

7 = very familiar
1 = not at all familiar

PRODUCT CLASS	DEGREE OF FAMILIARITY	EVER PURCHASED?
Refrigerator	7 6 5 4 3 2 1	Yes No

Now please answer the following questions.

Age ________

Sex M F

UF classification ________

Thank you for your cooperation in answering this questionnaire.

SAMPLE QUESTION

PRODUCT: FAMILY CAR
UNKNOWN ATTRIBUTE: GAS MILEAGE

A. Circle the letter of the best answer.

For most family cars, it is generally true that

1. a. the greater the seating capacity, the higher the gas mileage
   b. the greater the seating capacity, the lower the gas mileage
   c. there is little relationship between seating capacity and gas mileage

2. a. the higher the rebate, the higher the gas mileage
   b. the lower the rebate, the lower the gas mileage
   c. there is little relationship between rebate and gas mileage

B. Rate the attractiveness of your best guess about the GAS MILEAGE of each of the family cars described below. Remember that you are rating the attractiveness of the GAS MILEAGE, not the attractiveness of the information that you are given about the product. Depending on how you think the two attributes are related, the attractiveness of the imagined attribute may be similar to, opposite to, or unrelated to the attractiveness of the known attribute.

3 = very attractive
0 = neither attractive nor unattractive
-3 = very unattractive

What Is Known About Family Car	Attractiveness of Imagined GAS MILEAGE
seats 4 adults	3 2 1 0 -1 -2 -3
seats 2 adults	3 2 1 0 -1 -2 -3
seats 8 adults	3 2 1 0 -1 -2 -3
seats 6 adults	3 2 1 0 -1 -2 -3
$200 rebate	3 2 1 0 -1 -2 -3
$1000 rebate	3 2 1 0 -1 -2 -3
$300 rebate	3 2 1 0 -1 -2 -3
$500 rebate	3 2 1 0 -1 -2 -3

Questionnaire Used in Experiment I

CONSUMER SURVEY

In the following pages you will be asked to evaluate some products based on brief descriptions of these products, and you will be asked some questions about how you arrived at these evaluations. This information will be used in conducting research to help us understand consumer preferences.

Before beginning the survey, please read and sign the following informed consent form:

Participation in this research will not provide any benefits to you other than the knowledge you will gain about how such research is conducted. This procedure should not cause you any discomfort; however, if you wish not to participate in this research for any reason, you are free to withdraw at any time. Of course, you will not receive credit for participation if you choose to withdraw.

There will be no compensation for participation other than 1 hour of research participation credit.

If you agree to participate in this research, please read and sign the following statement:

I have read and I understand the procedure described above. I agree to participate in the procedure and I have received a copy of this description.

Signatures:

-- ----------------

Subject Date

-- ----------------

Witness Date

INSTRUCTIONS

On the following pages, you will be given a number of brief descriptions of products. The descriptions are similar to those which appear in a catalog which carries items from a wide variety of manufacturers. Imagine that you are trying to evaluate the products for the purpose of making a purchase decision. Then rate the attractiveness of each product on the scale provided. Circle the number which corresponds to how attractive the described product is to you, with a 3 indicating "very attractive," a 0 indicating "neither attractive nor unattractive," and a -3 indicating "very unattractive."

Rate the product descriptions in the order they are presented to you. Make each evaluation separately, without referring back to your previous evaluations. You may be asked to rate the same product description more than once. Don't worry about trying to make sure your evaluations of the same description are identical. Just try to evaluate each product description as you would if you were actually anticipating a purchase.

REFRIGERATORS

All of the refrigerators in this catalog are intended for family use. Although the refrigerators come from a variety of different manufacturers, all models include lighted interior, adjustable cold control, reversible flush-hinged doors with magnetic gaskets, and are available in a number of exterior colors and finishes. All are UL listed for 110-120-v., 60-Hz. AC.

Details for various models are given on the following pages. Please rate the attractiveness of each model on the scale provided.

PRODUCT: REFRIGERATOR

3 = very attractive
0 = neither attractive
nor unattractive
-3 = very unattractive

CAT. NO.	DESCRIPTION	ATTRACTIVENESS RATING
A4389	4 cu. ft. refrigerator capacity	3 2 1 0 -1 -2 -3
A4301	18 cu. ft. refrigerator capacity	3 2 1 0 -1 -2 -3
A4362	6 cu. ft. refrigerator capacity	3 2 1 0 -1 -2 -3
A4375	25 cu. ft. refrigerator capacity	3 2 1 0 -1 -2 -3

PRODUCT: REFRIGERATOR

3 = very attractive
0 = neither attractive nor unattractive
-3 = very unattractive

CAT. NO.	DESCRIPTION	ATTRACTIVENESS RATING
A4301	18 cu. ft. refrigerator capacity	3 2 1 0 -1 -2 -3
A4389	4 cu. ft. refrigerator capacity	3 2 1 0 -1 -2 -3
A4375	25 cu. ft. refrigerator capacity	3 2 1 0 -1 -2 -3
A4362	6 cu. ft. refrigerator capacity	3 2 1 0 -1 -2 -3

STEAM CARPET CLEANERS

Although they come from a variety of different manufacturers, all of the steam carpet cleaners in this catalog are canister models with casters which allow them to roll across carpeted floors. All are constructed of high impact plastic. To operate, the supply tank must be filled with a cleaning solution of water and specially formulated carpet cleaner. A heating element maintains the cleaning solution at 120°F. A water pump motor sprays the cleaning solution while a wet pickup motor removes the solution from the carpet. All are UL listed for 110-120-v., 60-Hz. AC.

Details for various models are given on the following pages. Please rate the attractiveness of each model on the scale provided.

PRODUCT: STEAM CARPET CLEANER

3 = very attractive
0 = neither attractive nor unattractive
-3 = very unattractive

CAT. NO.	DESCRIPTION	ATTRACTIVENESS RATING
A5765	suitable for most carpets cleans .75 average room/refill	3 2 1 0 -1 -2 -3
A5790	cleans 2.25 average rooms/refill suitable for all carpets and rugs	3 2 1 0 -1 -2 -3
A5702	suitable for most carpets cleans 3.00 average rooms/refill	3 2 1 0 -1 -2 -3
A5703	cleans 3.00 average rooms/refill suitable for all carpets and rugs	3 2 1 0 -1 -2 -3
A5712	cleans .75 average room/refill	3 2 1 0 -1 -2 -3
A5767	suitable only for outdoor type carpets cleans 2.25 average rooms/refill	3 2 1 0 -1 -2 -3
A5713	suitable for most carpets	3 2 1 0 -1 -2 -3
A5723	suitable only for short pile synthetic carpets cleans .25 average room/refill	3 2 1 0 -1 -2 -3
A5753	suitable only for short pile synthetic carpets cleans .75 average room/refill	3 2 1 0 -1 -2 -3
A5770	cleans .25 average room/refill suitable for most carpets	3 2 1 0 -1 -2 -3
A5722	cleans 2.25 average rooms/refill	3 2 1 0 -1 -2 -3
A5778	cleans 3.00 average rooms/refill suitable only for outdoor type carpets	3 2 1 0 -1 -2 -3
A5707	cleans 2.25 average rooms/refill suitable only for short pile synthetic carpets	3 2 1 0 -1 -2 -3
A5762	cleans 3.00 average rooms/refill	3 2 1 0 -1 -2 -3
A5738	suitable only for short pile synthetic carpets	3 2 1 0 -1 -2 -3
A5717	suitable only for outdoor type carpets cleans .25 average room/refill	3 2 1 0 -1 -2 -3
A5792	cleans 3.00 average rooms/refill suitable only for short pile synthetic carpets	3 2 1 0 -1 -2 -3
A5757	cleans .75 average room/refill suitable for all carpets and rugs	3 2 1 0 -1 -2 -3
A5724	cleans .75 average room/refill suitable only for outdoor type carpets	3 2 1 0 -1 -2 -3
A5731	cleans .25 average room/refill suitable for all carpets and rugs	3 2 1 0 -1 -2 -3
A5788	suitable for most carpets cleans 2.25 average rooms/refill	3 2 1 0 -1 -2 -3
A5740	suitable for all carpets and rugs	3 2 1 0 -1 -2 -3
A5718	suitable only for outdoor type carpets	3 2 1 0 -1 -2 -3
A5759	cleans .25 average room/refill	3 2 1 0 -1 -2 -3

PRODUCT: STEAM CARPET CLEANER

3 = very attractive
0 = neither attractive
nor unattractive
-3 = very unattractive

CAT. NO.	DESCRIPTION	ATTRACTIVENESS RATING
A5702	cleans 3.00 average rooms/refill suitable for most carpets	3 2 1 0 -1 -2 -3
A5759	cleans .25 average room/refill	3 2 1 0 -1 -2 -3
A5731	suitable for all carpets and rugs cleans .25 average room/refill	3 2 1 0 -1 -2 -3
A5724	cleans .75 average room/refill suitable only for outdoor type carpets	3 2 1 0 -1 -2 -3
A5762	cleans 3.00 average rooms/refill	3 2 1 0 -1 -2 -3
A5765	suitable for most carpets cleans .75 average room/refill	3 2 1 0 -1 -2 -3
A5703	cleans 3.00 average rooms/refill suitable for all carpets and rugs	3 2 1 0 -1 -2 -3
A5707	cleans 2.25 average rooms/refill suitable only for short pile synthetic carpets	3 2 1 0 -1 -2 -3
A5767	suitable only for outdoor type carpets cleans 2.25 average rooms/refill	3 2 1 0 -1 -2 -3
A5722	cleans 2.25 average rooms/refill	3 2 1 0 -1 -2 -3
A5770	cleans .25 average room/refill suitable for most carpets	3 2 1 0 -1 -2 -3
A5738	suitable only for short pile synthetic carpets	3 2 1 0 -1 -2 -3
A5778	suitable only for outdoor type carpets cleans 3.00 average rooms/refill	3 2 1 0 -1 -2 -3
A5723	suitable only for short pile synthetic carpets cleans .25 average room/refill	3 2 1 0 -1 -2 -3
A5788	suitable for most carpets cleans 2.25 average rooms/refill	3 2 1 0 -1 -2 -3
A5740	suitable for all carpets and rugs	3 2 1 0 -1 -2 -3
A5713	suitable for most carpets	3 2 1 0 -1 -2 -3
A5717	cleans .25 average room/refill suitable only for outdoor type carpets	3 2 1 0 -1 -2 -3
A5753	cleans .75 average room/refill suitable only for short pile synthetic carpets	3 2 1 0 -1 -2 -3
A5712	cleans .75 average room/refill	3 2 1 0 -1 -2 -3
A5790	cleans 2.25 average rooms/refill suitable for all carpets and rugs	3 2 1 0 -1 -2 -3
A5792	cleans 3.00 average rooms/refill suitable only for short pile synthetic carpets	3 2 1 0 -1 -2 -3
A5718	suitable only for outdoor type carpets	3 2 1 0 -1 -2 -3
A5757	cleans .75 average room/refill suitable for all carpets and rugs	3 2 1 0 -1 -2 -3

Now look back on the pages containing product descriptions. In three places, there is a number (1, 2, or 3) in the left margin by a product description. For each of these three product descriptions, please describe briefly your thought processes as you made the evaluation. Indicate why you rated it as attractive or unattractive and what you thought about when trying to evaluate the product. Write your answer in the space provided by the corresponding number below.

Product Description 1:

Product Description 2:

Product Description 3:

Thank you for your help in responding to this questionnaire.

Questionnaire Used in Experiment II

CONSUMER SURVEY

This research is concerned with examining how consumers go about deciding if they like a product or not, and how much they like it or dislike it. You will be given descriptions of some products and asked how much you like them or dislike them and why. To participate in this research, it is necessary to read and sign the following informed consent form:

Participation in this research will not provide any benefits to you other than the knowledge you will gain about how such research is conducted. This procedure should not cause you any discomfort; however, if you wish not to participate in this research for any reason, you are free to withdraw at any time. Of course, you will not receive credit for participation if you choose to withdraw.

There will be no compensation for participation other than 1 hour research participation credit.

If you agree to participate in this research, please read and sign the following informed consent statement:

I have read and I understand the procedure described above. I agree to participate in the procedure and I have received a copy of this description.

Signatures:

--- ----------------
Subject Date

--- ----------------
Witness Date

INSTRUCTIONS

We are interested in learning how consumers go about deciding if they like a product or not, and just how much they like it or dislike it. We are going to give you some product descriptions, and ask you to tell us how much you like them or how much you dislike them and why. All of the products we will be asking you about are major appliances. Don't worry if you have no experience evaluating such products. Most people don't when they first start shopping around. Just give us your honest impressions of these products.

All of the appliances we will be asking you about are marketed by a large distributor which carries models from a wide variety of manufacturers. This distributor publishes a catalog. You will be shown a representation of the catalog pages that describe each product.

Sometimes you'll be asked to rate products on the following scale:

-5	-4	-3	-2	-1	0	+1	+2	+3	+4	+5
very unattractive					neither attractive nor unattractive					very attractive

Just circle the number which corresponds to how much you like or dislike the product, how attractive or unattractive it is to you.

There are a couple of things you need to know about how to use this rating scale. First, your ratings should accurately indicate how much difference there is in the attractiveness of various products. All this means is that if you rate Product A as +1, Product B as +2, and Product C as +3, you're saying that you think that the difference in attractiveness between Product A and Product B (one point on the rating scale) is the same as the difference in attractiveness between Product B and Product C (also one point on the rating scale). If you instead rated Product C as +4, you would be saying that the difference in attractiveness between Product B and Product C (two points on the rating scale) is twice as great as the difference in attractiveness of Product A and Product B.

Second, it is important that you are consistent in how you use the scale, that if you rate Product A as +2 and Product B as +2, you do actually like them about equally well. To help you use the scale consistently, we will give you some practice rating tasks prior to having you rate each of the appliances.

Before you rate the steam carpet cleaners carried by this distributor, we want you to practice using the rating scale by rating some carpet cleaning services. The purpose of this practice is to fix firmly in your mind just how attractive a +5 is, and just how unattractive a -5 is. Then when you go on to rate the steam carpet cleaners, you'll be better able to use the rating scale consistently.

Imagine that you need to have your carpets cleaned and are considering using a professional cleaning service. Below are the descriptions of the cleaning services that are available. Please read over these descriptions carefully.

CARPET CLEANING SERVICES

Service A	carpets require 3 days to dry not responsible for any damage to carpet or furniture customer is responsible for moving furniture advance payment required--not refundable for any reason customers should plan to leave house for 24 hours due to fumes from cleaning fluid
Service B	pay only if completely satisfied after job completion we move your furniture and return it to original location carpets ready for use in 1 hour fully insured--we pay for any damages even if not our fault no odor or fumes
Service C	carpets ready for use in 3 hours fully insured--we pay for any damages no odor, no mess satisfaction guaranteed or no charge for services we carefully move your furniture and replace it when finished
Service D	moving furniture is customer's responsibility advance payment required--not refundable for any reason not responsible for damages to carpet or furniture carpet requires 5 days to dry customers should plan to leave house for 48 hours due to fumes from cleaning fluid

In the booklet marked RESPONSES, you'll find a rating scale to use to rate the attractiveness of each of these services. Please make these ratings carefully. Try to fix in your mind just how good a +5 is and just how bad a -5 is, so that the points on the scale will have the same meaning to you later when you rate the steam carpet cleaners in the catalog. When you are through rating these services, please go on to the next page of the instructions.

Now that you have practiced rating these carpet cleaning services, we want you to examine the steam carpet cleaners carried by the applicance distributor. Imagine that instead of using a professional cleaning service, you want to purchase your own steam carpet cleaner. On the following page, you will find the catalog descriptions of the steam carpet cleaners carried by the distributor.

Please examine the catalog information carefully. As you read each catalog entry, try to form an impression of how attractive the described steam carpet cleaner is to you. Don't worry about remembering the various catalog numbers and features, and don't worry about making a choice. The main purpose of looking over these descriptions and mentally evaluating them is to give you a general idea of the types of steam carpet cleaners that are available, and to get you thinking about what makes a steam carpet cleaner attractive or unattractive to you. Looking over a catalog this way is one thing you might do if you were first beginning to think about purchasing a steam carpet cleaner.

When you have thoroughly examined the catalog information about the steam carpet cleaners carried by this distributor, please go on to the next page of the instructions.

STEAM CARPET CLEANERS

Although they come from a variety of different manufacturers, all of the steam carpet cleaners in this catalog are canister models with casters which allow them to roll across carpeted floors. All are constructed of high impact plastic. To operate, the supply tank must be filled with a cleaning solution of water and specially formulated carpet cleaner. A heating element maintains the cleaning solution at 120°F. A water pump motor sprays the cleaning solution while a wet pickup motor removes the solution from the carpet. All are UL listed for 110-120-v., 60-Hz. AC.

CAT. NO.	DESCRIPTION
A5054	suitable for all carpets and rugs
A5756	suitable only for outdoor type carpets
A5333	suitable only for short weave synthetic carpets
A5241	suitable for most carpets and rugs
A5478	suitable for all carpet types
A5668	suitable only for short pile synthetic carpets
A5672	suitable for most carpets
A5123	suitable only for patio type carpets

Now that you have finished looking over the steam carpet cleaners, we want to know how much you like or dislike each one of them. On the next several pages of the response booklet, you will find the catalog description of one of the steam carpet cleaners, along with a rating scale so that you can indicate how attractive or unattractive that particular steam carpet cleaner is to you.

Go through the response booklet page by page and rate the steam carpet cleaners in the order in which they appear. Make each rating separately; don't look ahead or back. Based on your ratings of the carpet cleaning services, keep in mind just how attractive a +5 is, and just how unattractive a -5 is, so that your ratings are as consistent as you can make them.

Go ahead and rate all of the steam carpet cleaners now before you continue reading the instructions.

Sometimes when one considers a purchase, one finds that the alternatives on the market aren't particularly attractive. When this is true, the idea of NOT making a purchase may become attractive. That's what we want to find out from you. Imagine that you want to purchase a steam carpet cleaner if you can find one you like. Based on what you have learned about the steam carpet cleaners that are available, consider whether you think you would want to NOT make the purchase after all. Based on what you have learned about the steam carpet cleaners, how attractive or unattractive is the prospect of NOT making a purchase, given that you would like to make a purchase if you can find a steam carpet cleaner you like?

Please turn to the next page in your response booklet to answer this question. Then go on to the next page of the instructions.

Now that you have finished rating the steam carpet cleaners, we want you to rate the carpet cleaning services again. It is important for us to know if your ratings of the cleaning services have changed or remained the same, so that we can tell if you are using the rating scale consistently.

Below are the descriptions of the carpet cleaning services. The next page in your response booklet contains scales for you to use to rate these services. Please make your ratings without looking back to see how you rated them before.

CARPET CLEANING SERVICES

Service A	carpets require 3 days to dry not responsible for any damage to carpet or furniture customer is responsible for moving furniture advance payment required--not refundable for any reason customers should plan to leave house for 24 hours due to fumes from cleaning fluid
Service B	pay only if completely satisfied after job completion we move your furniture and return it to original location carpets ready for use in 1 hour fully insured--we pay for any damages even if not our fault no odor or fumes
Service C	carpets ready for use in 3 hours fully insured--we pay for any damages no odor, no mess satisfaction guaranteed or no charge for services we carefully move your furniture and replace it when finished
Service D	moving furniture is customer's responsibility advance payment required--not refundable for any reason not responsible for damages to carpet or furniture carpet requires 5 days to dry customers should plan to leave house for 48 hours due to fumes from cleaning fluid

When you have finished rating these services, please go on to the next page of the instructions.

Before you rate the refrigerators carried by this distributor, we want you to practice using the rating scale by rating some refrigerator rental services. The purpose of this practice is to help you fix firmly in your mind just how attractive a +5 is, and just how unattractive a -5 is. Then when you go on to rate the refrigerators, you'll be better able to use the rating scale consistently.

Imagine that you need a refrigerator, but are not prepared to make a purchase immediately. Instead, you are planning to rent a refrigerator for a time, and purchase one later. Below are the descriptions of the rental services that are available. Please read over these descriptions carefully.

REFRIGERATOR RENTAL SERVICES

Service A	free delivery and installation of refrigerator free pickup of refrigerator when you are through renting 100% of rental fees may be applied toward purchase of any new or previously rented refrigerator first month free--rent always refundable for unused time no deposit required
Service B	$800 security deposit required $30 minimum delivery charge $30 minimum pickup charge (customers are required to use our delivery and pickup services) rental fees are not applicable to purchases 4 months' rent required in advance, not refundable for unused time
Service C	$400 security deposity required 2 months' rent required in advance, not refundable rental fees are not applicable to purchases $20 minimum delivery charge $20 minimum pickup charge (customers are required to use our delivery and pickup services)
Service D	free delivery free pickup rent payable one month in advance--refundable for any unused time no security deposit 70% of rental fees applicable to purchase of any refrigerator in stock

In the booklet marked RESPONSES, you'll find a rating scale to use to rate the attractiveness of each of these services. Please make these ratings carefully. Try to fix in your mind just how good a +5 is, and just how bad a -5 is, so that the points on the scale will have the same meaning to you later when you rate the refrigerators in the catalog. When you are through rating these services, please go on the next page of the instructions.

Now that you have practiced rating the refrigerator rental services, we want you to examine the refrigerators carried by the applicance distributor. Imagine that instead of renting a refrigerator, you want to purchase one. On the next page you will find the catalog descriptions of the refrigerators carried by the distributor.

Please examine the catalog information carefully. As you read each catalog entry, try to form an impression of how attractive the described refrigerator is to you. Don't worry about remembering the various catalog numbers and features, and don't worry about making a choice. The main purpose of looking over these refrigerators and mentally evaluating them is to give you a general idea of the types of refrigerators that are available, and to get you thinking about what makes a refrigerator attractive or unattractive to you. Looking over a catalog this way is one thing you might do if you were first beginning to think about purchasing a refrigerator.

When you have thoroughly examined the catalog information about the refrigerators carried by this distributor, please go on to the next page in the instructions.

REFRIGERATORS

All of the refrigerators in this catalog are intended for family use. Although the refrigerators come from a variety of different manufacturers, all models include lighted interior, adjustable cold control, reversible flush-hinged doors with magnetic gaskets, and are available in a number of exterior colors and finishes. All are UL listed for 110-120-v., 60-Hz. AC.

CAT. NO.	DESCRIPTION
T5311	3 months warranty 18.5 cu. ft. refrigerator capacity
T5224	4 cu. ft. refrigerator capacity
T5413	6.5 cu. ft. refrigerator capacity 25 months warranty
T5020	18 cu. ft. refrigerator capacity 2 years warranty
T5555	18 months warranty 25 cu. ft. refrigerator capacity
T5112	25 cu. ft. refrigerator capacity
T5443	4 cu. ft. refrigerator capacity 4 months warranty
T5466	5 months warranty 25.5 cu. ft. refrigerator capacity
T5787	4.5 cu. ft. refrigerator capacity 19 months warranty
T5234	2 months warranty 6 cu. ft. refrigerator capacity
T5040	6 cu. ft. refrigerator capacity
T5999	18 cu. ft. refrigerator capacity

Now that you have finished looking over the refrigerators, we want to know how much you like or dislike each one of them. On each of the next several pages in your response booklet, you will find the catalog description of one of the refrigerators, along with a rating scale so that you can indicate how attractive or unattractive that particular refrigerator is to you.

Go through the response booklet page by page and rate the refrigerators in the order in which they appear. Make each rating separately; don't look ahead or back. Based on your ratings of the refrigerator rental services, keep in mind just how attractive a +5 is, and just how unattractive a -5 is, so that your ratings are as consistent as you can make them.

Go ahead and rate all of the refrigerators now before you continue reading the instructions.

Sometimes when one considers a purchase, one finds that the alternatives on the market aren't particularly attractive. When this is true, the idea of NOT making a purchase may become attractive. That's what we want to find out from you. Imagine that you want to purchase a refrigerator if you can find one you like. Based on what you have learned about the refrigerators that are available, consider whether you think you would want to NOT make the purchase after all. Based on what you have learned about the refrigerators, how attractive or unattractive is the prospect of NOT making a purchase, given that you would like to make a purchase if you can find a refrigerator you like?

Please turn to the next page in your response booklet to answer this question. Then go on to the next page of the instructions.

Now that you have finished rating the refrigerators, we want you to rate the refrigerator rental services again. It is important for us to know if your ratings of the refrigerator rental services have changed or remained the same, so that we can tell if you are using the rating scale consistently.

Below are the descriptions of the refrigerator rental services. The next page in your response booklet contains scales for you to use to rate these services. Please make your ratings without looking back to see how you rated them before.

REFRIGERATOR RENTAL SERVICES

Service A	free delivery and installation of refrigerator free pickup of refrigerator when you are through renting 100% of rental fees may be applied toward purchase of any new or previously rented refrigerator first month free--rent always refundable for unused time no deposit required
Service B	$800 security deposit required $30 minimum delivery charge $30 minimum pickup charge (customers are required to use our delivery and pickup services) rental fees are not applicable to purchases 4 months´ rent required in advance, not refundable for unused time
Service C	$400 security deposity required 2 months´ rent required in advance, not refundable rental fees are not applicable to purchases $20 minimum delivery charge $20 minimum pickup charge (customers are required to use our delivery and pickup services)
Service D	free delivery free pickup rent payable one month in advance--refundable for any unused time no security deposit 70% of rental fees applicable to purchase of any refrigerator in stock

When you have finished rating these services, please go on the next page of the instructions.

Now we'd like for you to tell us something about how you decided just how much you liked or disliked some of the products you have seen. On the final pages of your response booklet, the catalog entries for some of the refrigerators and steam carpet cleaners are reproduced. In the space provided, please tell us how you decided how much you liked or disliked the product. In as much detail as possible, tell us everything you thought about when evaluating the product and exactly why you decided that you liked or disliked it as much as you did. It may help to think about why you rated the product as more or less attractive than other models carried by the distributor.

When you are through answering these questions, please return all of the materials to the experimenter. Thank you for your help in this research.

APPENDIX III
ORDER EFFECTS IN PROMPTED INFERENCES

The following analysis examines order effects in prompted inferences in the data reported in Chapter V.

Overview

Inferences about five attributes were examined in each of two product classes. Subjects were asked to make inferences about each attribute based on knowledge about each of the other four attributes. Order of inferred attributes was counterbalanced across subjects. Counterbalancing sequences are illustrated in Tables A3-1 and A3-2 for refrigerators and carpet cleaners, respectively.

Prior to making the inferences, subjects were asked to rate the attractiveness of each attribute description. To obtain a measure of the expected relationship between the evaluative implications of the known and inferred attributes, Pearson product-moment correlation coefficients were calculated between the rated attractiveness of the known attribute and the rated attractiveness of the inferred attribute for each subject. Because r is not interval scaled nor is its sampling distribution normal, these correlations were transformed via Fisher's r to z' algorithm, which produces interval scaled values and a distribution that is approximately normal. Values for z' range from negative infinity when $r = -1$ to positive infinity when $r = +1$. Because some of the observed correlations were -1 and +1, bounds were

Table A3-1
Counterbalancing Sequence for Prompted Inferences for Refrigerators

	Position				
Sequence	1	2	3	4	5
1	price	shelf space	energy cost	warranty	capacity
2	capacity	warranty	shelf space	price	energy cost
3	warranty	price	capacity	energy cost	shelf space
4	energy cost	capacity	price	shelf space	warranty
5	shelf space	energy cost	warranty	capacity	price

Table A3-2
Counterbalancing Sequence for Prompted Inferences for Carpet Cleaners

	Position				
Sequence	1	2	3	4	5
1	price	versatility	tank capacity	weight	area cleaned
2	versatility	tank capacity	area cleaned	price	weight
3	weight	area cleaned	price	versatility	tank capacity
4	area cleaned	price	weight	tank capacity	versatility
5	tank capacity	weight	versatility	area cleaned	price

placed on the transformed values. Bounds were established at +3.453 and -3.453, the z's associated with $|r| = .998$. Reported means have been transformed back to correlation coefficients.

An analysis of variance with known attribute (four levels) as a within subjects factor and counterbalancing sequence or position (five levels) as a between subjects factor was conducted for each inferred attribute. As can be seen from Tables A3-1 and A3-2, for any given inferred attribute, counterbalancing sequence and position were perfectly confounded.

The intent of the analysis was to determine if the order in which inferences were made affected the nature of the inference process. It was expected that correlations between known and inferred attributes would differ for different known attributes. It was not expected that the order in which inferences were made would affect these correlations. Such an effect would be indicated by a significant known attribute x position interaction, and would imply that correlations based on data from all sequences may not correctly represent perceived correlations between known and inferred attributes. This could occur, for example, if subjects tended to make all inferences using their perceived correlation for the first known and inferred attribute combination, rather than by carefully considering the relationship between each attribute pair.

As noted previously, a separate analysis was conducted for each inferred attribute. From the standpoint of controlling error rate, it would have been desirable to conduct one analysis including all five inferred attributes for each product class. This procedure was not followed because the four known attributes were not the same for each inferred attribute, but were always the four attributes other than the one to be inferred. Therefore the analysis of variance would have contained five missing cells, one for each impossible known and inferred attribute combination.

The use of multiple analyses of variance creates concern about the overall error rate, and makes it desirable to set alpha at a conservative level. On the other hand, the need to establish that the known attribute x position interaction is nonsignificant makes it desirable to set alpha at a less conservative level. These competing concerns were balanced by choosing an alpha of .05, which yields an experimentwise error rate of .23 $(1-(1-.05)^5)$.

Results

Mean correlations and summaries of the analyses of variance are in Tables A3-3 through A3-28. (These analyses examine correlations between all possible attribute pairs and not just the pairs that were predicted to provide the needed manipulation of expected relationships between known and missing information. For the most part, these means exhibit the same patterns noted in Chapter V. Attribute pairs that would be expected to have a positive correlation generally do; attribute pairs that would be expected to have a negative correlation generally do; however, attribute pairs expected to have no correlation generally exhibit correlations of intermediate positive values. This pattern suggests that some subjects used evaluative consistency to make prompted inferences when there was no expected semantic relationship between attributes.)

Table A3-3
Mean Correlation of Attractiveness of Known Attribute with Inferred Value of Warranty

	Position					
Known attribute	1	2	3	4	5	Mean
Shelf space	.59	.46	.38	.72	.35	.52
Energy cost	-.55	.25	-.56	-.19	-.29	-.29
Price	-.75	-.95	-.90	-.92	-.92	-.90
Capacity	.74	.58	.73	.76	.25	.64
Mean	.01	-.11	-.19	.04	-.30	

Note: Mean correlations were calculated using Fisher's *r* to *z*' transformation.

Table A3-4
Analysis of Variance
Correlations of Attractiveness of Known Attribute with Inferred Value of Warranty

Source	*df*	*SS*	*MS*	*F*	*p*
Between					
Position	4	6.57	1.64	.61	.6538
Subjects(position)	95	254.22	2.68		
Within					
Attribute	3	313.17	104.39	54.55*	.0001
Attribute x position	12	23.84	1.99	1.04	.4138
Attribute x subjects(position)	285	545.42	1.91		
	399	1143.23			

*p < .05

Note: Analysis of variance was performed on Fisher's *r* to *z*' transformation.

Table A3-5
Mean Correlation of Attractiveness of Known Attribute with Inferred Value of Shelf Space

	Position					
Known attribute	1	2	3	4	5	Mean
Warranty	.75	.67	.78	.18	.65	.64
Energy Cost	-.86	-.84	-.83	-.67	-.80	-.81
Price	-.77	-.91	-.92	-.92	.96	-.91
Capacity	.97	.98	.98	.97	.97	.97
Mean	.17	.09	.16	-.03	-.03	

Note: Mean correlations were calculated using Fisher's *r* to *z*' transformation.

Table A3-6
Analysis of Variance
Correlations of Attractiveness of Known Attribute with Inferred Value of Shelf Space

Source	*df*	*SS*	*MS*	*F*	*p*
Between					
Position	4	3.34	.84	.46	.7682
Subjects(position)	95	174.29	1.83		
Within					
Attribute	3	892.00	297.30	151.69*	.0001
Attribute x position	12	18.20	1.52	.77	.6774
Attribute x subjects(position)	285	558.64	1.96		
	399	1646.47			

*$p < .05$

Note: Analysis of variance was performed on Fisher's *r* to *z*' transformation.

Table A3-7
Mean Correlation of Attractiveness of Known Attribute with Inferred Value of Energy Cost

	Position					
Known attribute	1	2	3	4	5	Mean
Warranty	.83	.55	.69	.76	.36	.67
Shelf space	-.67	-.80	-.85	-.84	-.36	-.74
Price	-.03	.33	.21	.40	.59	.32
Capacity	-.95	-.94	-.83	-.95	-.59	-.90
Mean	-.36	-.44	-.33	-.39	.00	

Note: Mean correlations were calculated using Fisher's *r* to *z*' transformation.

Table A3-8
Analysis of Variance
Correlations of Attractiveness of Known Attribute with Inferred Value of Energy Cost

Source	*df*	*SS*	*MS*	*F*	*p*
Between					
Position	4	10.95	2.74	.61	.6558
Subjects(position)	95	425.86	4.48		
Within					
Attribute	3	338.46	112.82	41.51*	.0001
Attribute x position	12	35.08	2.92	1.08	.3805
Attribute x subjects(position)	285	774.60	2.71		
	399	1584.96			

$^*p < .05$

Note: Analysis of variance was performed on Fisher's *r* to *z*' transformation.

Table A3-9
Mean Correlation of Attractiveness of Known Attribute with Inferred Value of Price

	Position					
Known attribute	1	2	3	4	5	Mean
Warranty	-.76	-.63	-.90	-.72	-.78	-.77
Shelf space	-.94	-.43	-.90	-.86	-.93	-.87
Energy cost	.08	.33	-.25	.54	.87	.40
Capacity	-.96	-.13	-.94	-.95	-.89	-.89
Mean	-.82	-.24	-.84	-.70	-.60	

Note: Mean correlations were calculated using Fisher's r to z' transformation.

Table A3-10
Analysis of Variance
Correlations of Attractiveness of Known Attribute with Inferred Value of Price

Source	*df*	*SS*	*MS*	F	p
Between					
Position	4	50.86	12.71	1.68	.1608
Subjects(position)	95	718.61	7.56		
Within					
Attribute	3	223.20	74.40	30.78*	.0001
Attribute x position	12	52.43	4.37	1.81*	.0466
Attribute x subjects(position)	285	688.84	2.42		
	399	1733.94			

*$p < .05$

Note: Analysis of variance was performed on Fisher's r to z' transformation.

Table A3-11
Simple Effects of Position
Correlations of Attractiveness of Known Attribute with Inferred Value of Price

Source	*df*	*SS*	*MS*	*F*	*p*
Known Attribute: Warranty					
Position	4	5.69	1.42	.30	.8795
Subjects(position)	95	455.73	4.80		
Known Attribute: Shelf Space					
Position	4	21.38	5.35	1.87	.1215
Subjects(position)	95	271.10	2.85		
Known Attribute: Energy Cost					
Position	4	29.50	7.38	1.71	.1540
Subjects(position)	95	409.56	4.31		
Known Attribute: Capacity					
Position	4	46.71	11.68	4.09*	.0042
Subjects(position)	95	271.06	2.85		

$^*p < .05$

Table A3-12
Simple Comparisons of Position
Correlations of Attractiveness of Capacity with Inferred Value of Price

Pairwise Differences in z' Means

	Position			
Position	1	2	3	4
2	1.88*			
3	.24	1.64*		
4	.13	1.75*	.11	
5	.59	1.29	.35	.46

*$p < .05$ familywise

Note: Minimum pairwise significant difference (Tukey) = 1.49

Table A3-13
Mean Correlation of Attractiveness of Known Attribute with Inferred Value of Capacity

	Position					
Known attribute	1	2	3	4	5	Mean
Warranty	.79	.75	.67	.84	.61	.74
Shelf space	.96	.95	.95	.95	.98	.96
Energy cost	-.81	-.92	-.62	-.95	-.94	-.89
Price	-.93	-.87	-.84	-.89	-.95	-.90
Mean	.05	-.02	.16	-.06	-.13	

Note: Mean correlations were calculated using Fisher's *r* to *z*' transformation.

Table A3-14
Analysis of Variance
Correlations of Attractiveness of Known Attribute with Inferred Value of Capacity

Source	*df*	*SS*	*MS*	*F*	*p*
Between					
Position	4	4.01	1.00	.40	.8105
Subjects(position)	95	240.08	2.53		
Within					
Attribute	3	885.83	295.28	150.02*	.0001
Attribute x position	12	24.35	2.03	1.03	.4204
Attribute x subjects(position)	285	560.97	1.97		
	399	1715.24			

*p < .05

Note: Analysis of variance was performed on Fisher's *r* to *z*' transformation.

Table A3-15
Mean Correlation of Attractiveness of Known Attribute with Inferred Value of Versatility

	Position					
Known attribute	1	2	3	4	5	Mean
Tank Capacity	.53	.49	.62	.65	.59	.58
Weight	.28	-.32	.48	.03	-.48	0.00
Price	.68	.74	.72	.79	.53	.70
Area cleaned	-.86	-.86	-.37	-.63	-.81	-.75
Mean	.10	-.04	.41	.28	-.09	

Note: Mean correlations were calculated using Fisher's *r* to *z*' transformation.

Table A3-16
Analysis of Variance
Correlations of Attractiveness of Known Attribute with Inferred Value of Versatility

Source	*df*	*SS*	*MS*	*F*	*p*
Between					
Position	4	15.89	3.97	1.03	.3964
Subjects(position)	95	366.76	3.86		
Within					
Attribute	3	205.05	68.35	47.56*	.0001
Attribute x position	12	14.76	1.23	.86	.5928
Attribute x subjects(position)	285	409.58			
	399	1012.04			

**p* < .05

Note: Analysis of variance was performed on Fisher's *r* to *z*' transformation.

Table A3-17
Mean Correlation of Attractiveness of Known Attribute with Inferred Value of Tank Capacity

	Position					
Known attribute	1	2	3	4	5	Mean
Versatility	.74	.82	.89	.43	.58	.73
Weight	-.23	-.72	-.68	-.89	-.75	.70
Price	.99	.98	.98	.97	.89	.97
Area cleaned	-.20	-.29	-.75	-.22	.17	-.30
Mean	.66	.51	.43	.24	.31	

Note: Mean correlations were calculated using Fisher's *r* to *z*' transformation.

Table A3-18
Analysis of Variance
Correlations of Attractiveness of Known Attribute with Inferred Value of Tank Capacity

Source	*df*	*SS*	*MS*	*F*	*p*
Between					
Position	4	14.80	3.70	1.06	.3810
Subjects(position)	95	331.76	3.49		
Within					
Attribute	3	543.99	181.33	85.58*	.0001
Attribute x position	12	41.32	3.44	1.63	.0840
Attribute x subjects(position)	285	603.86	2.12		
	399	1535.72			

*$p < .05$

Note: Analysis of variance was performed on Fisher's *r* to *z*' transformation.

Table A3-19
Mean Correlation of Attractiveness of Known Attribute with Inferred Value of Weight

	Position					
Known attribute	1	2	3	4	5	Mean
Versatility	-.04	.47	-.53	.45	-.25	.02
Tank capacity	-.74	.74	-.86	-.11	-.63	-.41
Price	-.45	.57	-.90	-.35	-.83	-.52
Area cleaned	.23	.12	.65	-.04	.37	.29
Mean	-.30	.51	-.57	-.01	-.42	

Note: Mean correlations were calculated using Fisher's *r* to *z*' transformation.

Table A3-20
Analysis of Variance
Correlations of Attractiveness of Known Attribute with Inferred Value of Weight

Source	*df*	*SS*	*MS*	*F*	*p*
Between					
Position	4	71.24	17.81	2.33	.0614
Subjects(position)	95	727.70	7.64		
Within					
Attribute	3	48.90	16.30	6.19*	.0005
Attribute x position	12	73.04	6.09	2.31*	.0079
Attribute x subjects(position)	285	750.61	2.63		
	399	1669.49			

*$p < .05$

Note: Analysis of variance was performed on Fisher's *r* to *z*' transformation.

Table A3-21
Simple Effects of Position
Correlations of Attractiveness of Known Attribute with Inferred Value of Weight

Source	*df*	*SS*	*MS*	*F*	*p*
Known Attribute: Versatility					
Position	4	18.46	4.62	1.53	.1997
Subjects(position)	95	285.83	3.01		
Known Attribute: Tank Capacity					
Position	4	62.54	15.64	3.68*	.0079
Subjects(position)	95	403.41	4.25		
Known Attribute: Price					
Position	4	55.68	13.92	3.10*	.0191
Subjects(position)	95	427.27	4.50		
Known Attribute: Area Cleaned					
Position	4	7.59	1.90	.50	.7358
Subjects(position)	95	359.81	3.78		

*$p < .05$

Table A3-22
Simple Comparisons of Position
Correlations of Attractiveness of Tank Capacity
with Inferred Value of Weight

Pairwise Differences in *z*' Means

	Position			
Position	1	2	3	4
2	1.90*			
3	.33	2.23*		
4	.85	1.05	1.18	
5	.22	1.68	.55	.63

*p < .05 familywise

Note: Minimum pairwise significant difference (Tukey) = 1.82

Table A3-23
Simple Comparisons of Position
Correlations of Attractiveness of Price with
Inferred Value of Weight

Pairwise Differences in *z*' Means

	Position			
Position	1	2	3	4
2	1.14			
3	1.00	2.14*		
4	.12	1.02	1.12	
5	.71	1.85	.29	.83

*$p < .05$ familywise

Note: Minimum pairwise significant difference (Tukey) = 1.87

Table A3-24
Mean Correlation of Attractiveness of Known Attribute with Inferred Value of Price

	Position					
Known attribute	1	2	3	4	5	Mean
Versatility	.19	.74	.70	.75	.82	.68
Tank capacity	.98	.88	.93	.96	.96	.95
Weight	.87	.80	-.75	-.13	-.68	.70
Area cleaned	-.90	-.34	-.58	-.56	-.77	.68
Mean	-.05	.21	.23	.50	.31	

Note: Mean correlations were calculated using Fisher's *r* to *z'* transformation.

Table A3-25
Analysis of Variance
Correlations of Attractiveness of Known Attribute with Inferred Value of Price

Source	*df*	*SS*	*MS*	*F*	*p*
Between					
Position	4	14.58	3.65	.86	.4905
Subjects(position)	95	402.25	4.23		
Within					
Attribute	3	540.51	180.17	89.80*	.0001
Attribute x position	12	39.07	3.26	1.62	.0847
Attribute x subjects(position)	285	571.81	2.01		
	399	1568.21			

$^*p < .05$

Note: Analysis of variance was performed on Fisher's *r* to *z'* transformation.

Table A3-26
Mean Correlation of Attractiveness of Known Attribute with Inferred Value of Area Cleaned

	Position					
Known attribute	1	2	3	4	5	Mean
Versatility	-.39	-.78	-.54	-.10	.15	-.38
Tank capacity	-.91	-.89	-.34	-.62	.01	-.67
Weight	.59	.79	.05	.79	.29	.56
Price	.79	-.82	-.60	.76	-.13	-.67
Mean	-.53	-.56	-.38	-.19	.08	

Note: Mean correlations were calculated using Fisher's *r* to *z'* transformation.

Table A3-27
Analysis of Variance
Correlations of Attractiveness of Known Attribute with Inferred Value of Area Cleaned

Source	*df*	*SS*	*MS*	*F*	*p*
Between					
Position	4	28.26	7.07	.77	.5489
Subjects(position)	95	874.30	9.20		
Within					
Attribute	3	139.68	46.56	18.60*	.0001
Attribute x position	12	55.82	4.65	1.86*	.0393
Attribute x subjects(position)	285	713.39			
	399	1811.45			

*$p < .05$

Note: Analysis of variance was performed on Fisher's *r* to *z'* transformation.

Table A3-28
Simple Effects of Position
Correlations of Attractiveness of Known Attribute with Inferred Value of Area Cleaned

Source	*df*	*SS*	*MS*	*F*	*p*
Known Attribute: Versatility					
Position	4	17.04	4.26	.93	.4500
Subjects(position)	95	435.70	4.59		
Known Attribute: Tank Capacity					
Position	4	36.29	9.07	2.28	.0663
Subjects(position)	95	378.05	3.98		
Known Attribute: Weight					
Position	4	17.00	4.25	1.40	.2399
Subjects(position)	95	288.84	3.04		
Known Attribute: Price					
Position	4	13.74	3.44	.67	.6144
Subjects(position)	95	485.11	5.11		

As predicted, for most inferred attributes, there was a main effect of known attribute, no main effect of position, and no known attribute x position interaction. There was a known attribute x position interaction, however, for inferred price for the refrigerator product class, and for inferred weight and area cleaned for the carpet cleaner product class. These analyses are discussed below.

Inferences about Refrigerator Price

Mean correlations are in Table A3-9, and the analysis of variance is summarized in Table A3-10. The simple effects of position, summarized in Table A3-11, were significant only for the known attribute capacity. Simple comparisons of these position means are summarized in Table A3-12. There were significant differences between positions 1 and 2, 2 and 3, and 2 and 4. The negative correlation between capacity and inferred price was relatively low at position 2 (-.13), but high at all other positions (ranging from -.89 to -.96). As can be seen in Table 5-6, the correlation based on data from all positions is -.60, while the median correlation is -.96. Therefore, it appears that the lower correlation at position 2 somewhat lowered the overall correlation, but that the conclusion that capacity and price are generally perceived to be negatively correlated in terms of their evaluative implications is correct.

Inferences about Carpet Cleaner Weight

Mean correlations are in Table A3-19, and the analysis of variance is summarized in Table A3-20. The simple effects of position, summarized in Table A3-21, were significant only for the known attributes tank capacity and price.

Simple comparisons of position means for the known attribute tank capacity are summarized in Table A3-22. There were significant differences between positions 1 and 2 and between positions 2 and 3. The correlation between known tank capacity and inferred weight was positive in position 2 (.74), while it was negative in all other positions, being most negative in positions 1 (-.74) and 3 (-.86). As this attribute combination is not planned to be used for the manipulation of the expected relationship between known and missing information, the overall correlation was not calculated. It appears, however, that tank capacity and weight are generally believed to be negatively correlated in terms of their evaluative implications.

Simple comparisons of position means for the known attribute price are summarized in Table A3-23. There was a significant difference between positions 2 and 3. The correlation between known price and inferred weight was positive in position 2 (.57), whereas it was negative at all other positions, being most negative at position 3 (-.90). This attribute combination is also not planned to be used in the manipulation of expected relationships, so no overall correlation was computed. It appears, however, that price and weight are generally thought to be negatively correlated in terms of their evaluative implications.

This may be an example of price being used to infer quality: a higher priced cleaner is assumed to be more attractive and therefore to weigh less. This is contrary to the inference that would be made if it were instead assumed that a higher priced cleaner is larger and more sturdy, and therefore heavier. Then, a positive correlation between price and weight, as observed at position 2, would be expected.

Inferences about Area Cleaned

Mean correlations are in Table A3-26, and the analysis of variance is summarized in Table A3-27. The simple effects of position, summarized in Table A3-27, were nonsignificant for every known attribute.

Discussion

Although there were some significant known attribute x position interactions, overall correlations appear to correctly represent perceived correlations between attributes. For the three known and inferred attribute combinations for which there was a significant effect of position, correlations at position 2 were more positive (or less negative) than correlations at other positions, which tended to be similar to one another. Correlations at these positions probably best represent general expectations about relationships between these attribute pairs. For the only one of these combinations for which an overall correlation was calculated (inferences about price based on knowledge of refrigerator capacity), the overall correlation was consistent with the correlations in positions 1, 3, 4, and 5.

There are a number of reasons that correlations between known and inferred attributes may be influenced by the order in which inferences are made. For example, order effects would occur if subjects persisted in using an inference strategy appropriate for the previous inferred attribute. This appears unlikely in the present case. The first inferred attribute was always perceived to be positively correlated with some known attributes and negatively correlated with others, indicating that even initially, subjects had little difficulty switching from a positive to a negative inference strategy. When inferred price was in position 2, the previous inferred attribute was warranty. Inferred warranty was positively correlated with shelf space and capacity and negatively correlated with energy cost and price (see Table A3-3 for mean correlations when warranty was the first inferred attribute). When inferred weight was in position 2, the previous inferred attribute was tank capacity, which was positively correlated with versatility and price and negatively correlated with weight and area cleaned (see Table A3-17).

Probably the most plausible explanation for the order effects observed here is an initial difficulty in making the transition between making inferences about one attribute to making inferences about a second attribute. The significant differences all occurred for the second inferred attribute, but not for later inferred attributes, as would be expected if some learning were involved in making these transitions. In addition, the correlations at position 2 were generally more positive than at other positions, as would be expected if some subjects relied on an evaluative consistency strategy when in doubt.

In summary, order effects in prompted inferences do not appear to be widespread. Overall correlations between attribute pairs chosen to manipulate the expected relationship between known and inferred attributes appear to correctly indicate how the attributes are generally thought to be related.

APPENDIX IV
SUPPLEMENTARY TABLES AND ANALYSES FOR EXPERIMENT I

Graphical Analysis of the Information Integration Process

In Experiment I, it was predicted that there would be a main effect of context, with evaluations in the two-attribute context being less favorable than evaluations in the one-attribute context. It was also predicted that there would be a context x attractiveness of the known attribute interaction, with evaluations in the two-attribute context exhibiting systematic differences in linear and quadratic trends when compared to evaluations in the one-attribute context. These predictions are based on the assumption that inferences, which are made only in the two-attribute context, are integrated with known information in a manner best represented by an averaging model which gives greater weight to less positive cues. If this model does not correctly represent the integration process, other patterns in evaluations would be predicted. For example, predicted differences in quadratic trends result from greater weight being given to less positive cues. If greater weight is not given to less positive cues, only differences in linear trend would be predicted.

Graphical analyses may determine if the model correctly represents the integration process. If information is integrated via an averaging process, then the attractiveness of an attribute should have less impact on overall evaluations when it is integrated with other attributes than when it is considered alone. This hypothesis can be tested by comparing evaluations of two-attribute descriptions with evaluations of one-attribute descriptions from the one-attribute context (which are predicted not to include inferences). If these evaluations are plotted as a function of the attractiveness of the common attribute, the slope of two-attribute evaluations should be less steep than the slope of one-attribute evaluations. This is the crossover interaction effect which is commonly used to diagnose whether the integration process is best represented by an averaging or an adding model.

If greater weight is given to less attractive cues, then an attribute should have less impact on overall evaluations when it is integrated with a relatively unattractive attribute than when it is integrated with a relatively attractive attribute. This hypothesis may be tested by examining evaluations of two-attribute descriptions. When the simple effects of the attractiveness of the first attribute are plotted, these lines should converge at lower levels of the attractiveness of the second attribute, indicating that the second attribute is receiving greater weight.

In general, both of these predicted patterns did occur in Experiment I. Representative graphs are in Figures A4-1 and A4-2. The slope of two-attribute evaluations is less steep than the slope of one-attribute evaluations from the one-attribute context, and evaluations of two-attribute descriptions converge at lower levels of attractiveness.

Therefore, these graphical analyses suggest that the averaging model which gives greater weight to less attractive information correctly represents the integration process. This model will be used

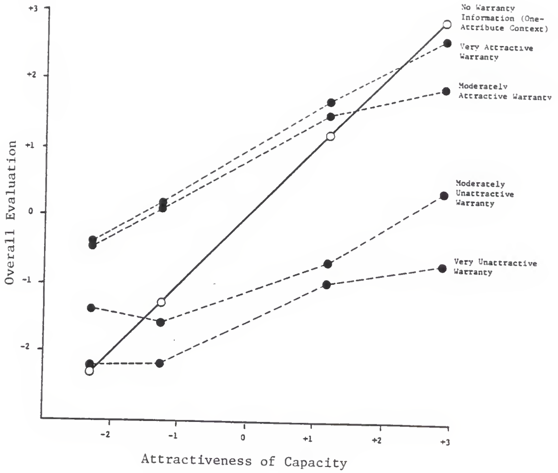

Figure A4-1
Refrigerator Evaluations
Based on Information about Capacity and Warranty

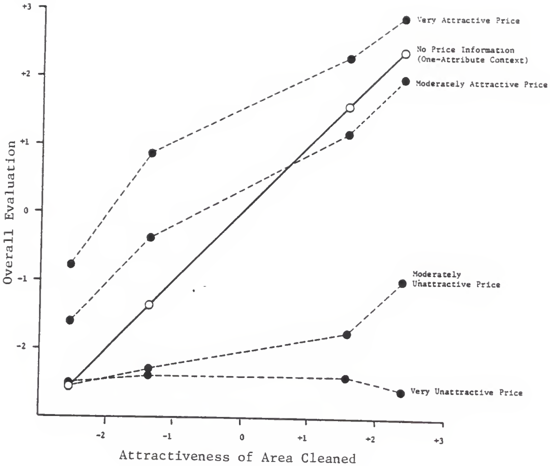

Figure A4-2
Carpet Cleaner Evaluations
Based on Information about Area Cleaned and Price

to predict patterns in evaluations which are posited to result from the integration of a known attribute and an inferred attribute.

Summary Tables for Planned Comparisons

Table A4-1
Planned Comparisons
Refrigerator Evaluations Based on Capacity
(Two-Attribute Context: Capacity and Warranty)

Source	*df*	*SS*	*MS*	*F*	*p*
Context	1	61.25	61.25	15.12*	.0016
Subjects(context x order)	14	56.70	4.05		
Linear x context	1	.20	.20	.02	.8881
Linear X subjects(context x order)	14	139.51	9.97		
Quadratic x context	1	1.44	1.44	1.01	.3331
Quadratic x subjects(context x order)	14	20.06	1.43		

*p < .05

Table A4-2
Planned Comparisons
Refrigerator Evaluations Based on Capacity
(Two-Attribute Context: Capacity and Shelf Space)

Source	*df*	*SS*	*MS*	*F*	*p*
Context	1	60.09	60.09	9.55*	.0080
Subjects(context x order)	14	88.10	6.29		
Linear x context	1	1.50	1.50	.16	.6920
Linear x subjects(context x order)	14	128.74	9.20		
Quadratic x context	1	.39	.39	.24	.6337
Quadratic x subjects(context x order)	14	22.78	1.63		

*p < .05

Table A4-3
Planned Comparisons
Refrigerator Evaluations Based on Capacity
(Two-Attribute Context: Capacity and Energy Cost)

Source	*df*	*SS*	*MS*	*F*	*p*
Context	1	.27	.27	.06	.8152
Subjects(context x order)	14	67.15	4.80		
Linear x context	1	5.78	5.78	.74	.4031
Linear x subjects(context x order)	14	108.84	7.77		
Quadratic x context	1	1.07	1.07	.66	.4303
Quadratic x subjects(context x order)	14	22.73	1.62		

Table A4-4
Planned Comparisons
Refrigerator Evaluations Based on Capacity
(Two-Attribute Context: Capacity and Price)

Source	*df*	*SS*	*MS*	*F*	*p*
Context	1	8.89	8.89	2.50	.1362
Subjects(context x order)	14	49.80	3.56		
Linear x context	1	.01	.01	0.00	.9781
Linear x subjects(context x order)	14	194.46	13.89		
Quadratic x context	1	1.05	1.05	.88	.3638
Quadratic x subjects(context x order)	14	16.71	1.19		

Table A4-5
Planned Comparisons
Refrigerator Evaluations Based on Warranty
(Two-Attribute Context: Capacity and Warranty)

Source	_df_	_SS_	_MS_	_F_	_p_
Context	1	12.80	12.80	2.03	.1759
Subjects(context x order)	14	88.19	6.30		
Linear x context	1	35.45	35.45	7.73*	.0147
Linear x subjects(context x order)	14	64.16	4.58		
Quadratic x context	1	.06	.06	.04	.8363
Quadratic x subjects(context x order)	14	18.05	1.29		

*_p_ < .05

Table A4-6
Planned Comparisons
Refrigerator Evaluations Based on Shelf Space
(Two-Attribute Context: Capacity and Shelf Space)

Source	_df_	_SS_	_MS_	_F_	_p_
Context	1	29.40	29.40	4.24	.0587
Subjects(context x order)	14	97.14	6.94		
Linear x context	1	43.63	43.63	22.81*	.0003
Linear x subjects(context x order)	14	26.78	1.91		
Quadratic x context	1	.07	.07	.09	.7692
Quadratic x subjects(context x order)	14	10.35	.74		

*_p_ < .05

Table A4-7
Planned Comparisons
Refrigerator Evaluations Based on Energy Cost
(Two-Attribute Context: Capacity and Energy Cost)

Source	*df*	*SS*	*MS*	*F*	*p*
Context	1	.43	.43	.18	.6804
Subjects(context x order)	14	33.64	2.40		
Linear x context	1	.72	.72	.40	.5382
Linear x subjects(context x order)	14	25.43	1.82		
Quadratic x context	1	.07	.07	.11	.7410
Quadratic x subjects(context x order)	14	8.50	.61		

Table A4-8
Planned Comparisons
Refrigerator Evaluations Based on Price
(Two-Attribute Context: Capacity and Price)

Source	*df*	*SS*	*MS*	*F*	*p*
Context	1	8.02	8.02	1.50	.2405
Subjects(context x order)	14	74.75	5.34		
Linear x context	1	9.25	9.25	1.48	.2446
Linear x subjects(context x order)	14	87.78	6.27		
Quadratic x context	1	.18	.18	.21	.6501
Quadratic x subjects(context x order)	14	11.90	.85		

Table A4-9
Planned Comparisons
Carpet Cleaner Evaluations Based on Area Cleaned
(Two-Attribute Context: Area Cleaned and Versatility)

Source	_df_	_SS_	_MS_	_F_	_p_
Context	1	3.76	3.76	.39	.5445
Subjects(context x order)	14	136.29	9.73		
Linear x context	1	54.44	54.44	11.16*	.0049
Linear x subjects(context x order)	14	68.29	4.88		
Quadratic x context	1	.03	.03	.01	.9106
Quadratic x subjects(context x order)	14	27.98	2.00		

*p < .05

Table A4-10
Planned Comparisons
Carpet Cleaner Evaluations Based on Area Cleaned
(Two-Attribute Context: Area Cleaned and Tank Capacity)

Source	_df_	_SS_	_MS_	_F_	_p_
Context	1	.09	.09	.08	.7810
Subjects(context x order)	14	15.49	1.11		
Linear x context	1	17.53	17.53	3.19	.0959
Linear x subjects(context x order)	14	77.00	5.50		
Quadratic x context	1	1.83	1.83	4.86*	.0448
Quadratic x subjects(context x order)	14	5.27	.38		

*p < .05

Table A4-11
Planned Comparisons
Carpet Cleaner Evaluations Based on Area Cleaned
(Two-Attribute Context: Area Cleaned and Weight)

Source	df	SS	MS	F	p
Context	1	3.47	3.47	3.36	.0883
Subjects(context x order)	14	14.49	1.03		
Linear x context	1	11.10	11.10	3.56	.0802
Linear x subjects(context x order)	14	43.71	3.12		
Quadratic x context	1	.16	.16	.17	.6841
Quadratic x subjects(context x order)	14	12.73	.91		

Table A4-12
Planned Comparisons
Carpet Cleaner Evaluations Based on Area Cleaned
(Two-Attribute Context: Area Cleaned and Price)

Source	df	SS	MS	F	p
Context	1	2.01	2.01	1.14	.3047
Subjects(context x order)	14	24.74	1.77		
Linear x context	1	49.10	49.10	6.38*	.0242
Linear x subjects(context x order)	14	107.68	7.69		
Quadratic x context	1	.62	.62	1.15	.3020
Quadratic x subjects(context x order)	14	7.62	.54		

*$p < .05$

Table A4-13
Planned Comparisons
Carpet Cleaner Evaluations Based on Versatility
(Two-Attribute Context: Area Cleaned and Versatility)

Source	_df_	_SS_	_MS_	_F_	_p_
Context	1	29.61	29.61	4.29	.0574
Subjects(context x order)	14	96.69	6.91		
Linear x context	1	21.05	21.05	4.08	.0630
Linear x subjects(context x order)	14	72.25	5.16		
Quadratic x context	1	2.66	2.66	2.21	.1590
Quadratic x subjects(context x order)	14	16.82	1.20		

Table A4-14
Planned Comparisons
Carpet Cleaner Evaluations Based on Tank Capacity
(Two-Attribute Context: Area Cleaned and Tank Capacity)

Source	_df_	_SS_	_MS_	_F_	_p_
Context	1	15.75	15.75	5.96*	.0285
Subjects(context x order)	14	36.99	2.64		
Linear x context	1	13.62	13.62	2.31	.1505
Linear x subjects(context x order)	14	82.42	5.89		
Quadratic x context	1	1.77	1.77	4.24	.0587
Quadratic x subjects(context x order)	14	5.85	.42		

*$p < .05$

Table A4-15
Planned Comparisons
Carpet Cleaner Evaluations Based on Weight
(Two-Attribute Context: Area Cleaned and Weight)

Source	df	SS	MS	F	p
Context	1	33.58	33.58	6.61*	.0222
Subjects(context x order)	14	71.14	5.08		
Linear x context	1	27.52	27.52	11.68*	.0042
Linear x subjects(context x order)	14	32.98	2.36		
Quadratic x context	1	.41	.41	.32	.5781
Quadratic x subjects(context x order)	14	17.92	1.28		

*$p < .05$

Table A4-16
Planned Comparisons
Carpet Cleaner Evaluations Based on Price
(Two-Attribute Context: Area Cleaned and Price)

Source	df	SS	MS	F	p
Context	1	0.00	0.00	0.00	.9926
Subjects(context x order)	14	55.14	3.94		
Linear x context	1	4.92	4.92	.91	.3558
Linear x subjects(context x order)	14	75.52	5.39		
Quadratic x context	1	1.44	1.44	1.17	.2969
Quadratic x subjects(context x order)	14	17.20	1.23		

Replication and Order Effects in Experiment I

In Experiment I, hypotheses were tested via a set of planned comparisons which examined the main effect of context and the linear and quadratic trend components of the context x attractiveness of the known attribute interaction. If these effects were involved in a significant interaction with other design factors, then the interpretation of the planned comparisons might be altered. To examine this possibility, an analysis of variance with information context (one-attribute and two-attribute) and order of presentation of the one-attribute context (first and second) as between subjects factors and attractiveness of the known attribute (very unattractive, moderately unattractive, moderately attractive, and very attractive) and replications (first and second) as within subjects factors was conducted for each known attribute (five attributes) in each product class.

From the standpoint of controlling error rate, it would have been desirable to conduct only one analysis for each product class, including known attribute (five levels) as a factor. This procedure was not followed because it would have resulted in a design with several missing cells. Although information context had only two levels for most known attributes (one-attribute and two-attribute), it had five levels for some known attributes (one one-attribute context and four different two-attribute contexts). To simplify the design, then, a separate analysis was conducted for each known attribute.

The use of multiple analyses of variance creates concern about the overall error rate, and makes it desirable to set alpha at a conservative level. On the other hand, the need to establish that the effects of interest do not interact with other design factors makes it desirable to set alpha at a less conservative level. These competing concerns were balanced by setting alpha at .05, yielding an experimentwise error rate of $1-(1-.05)^5 = .23$.

Although all effects involving the design factors order and replication were examined, it is the possiblility of interactions between these factors and the planned comparisons that is of primary interest. As will be seen below, interactions which altered the interpretation of the planned comparisons occurred in only two cases. In one case, a predicted difference in linear trend was not significant for all order and replication conditions, although the planned comparisons indicated it was significant overall. In the other case, a predicted difference in context was significant for one replication, although planned comparisons indicated it was not significant overall. On the whole, then, there is little evidence from this analysis that the planned comparisons are misleading.

Refrigerator Product Class

Capacity. The analysis of variance is summarized in Table A4-17. Although there was a significant main effect of replications, with evaluations being more favorable for the second replication

Table A4-17
Analysis of Variance
Refrigerator Evaluations Based on Capacity

Source	*df*	*SS*	*MS*	*F*	*p*
Between					
Context	4	122.96	30.74	7.52*	.0001
Order	1	.04	.04	.01	.9201
Context x order	4	6.83	1.71	.42	.7945
Subjects(context x order)	38	155.25	4.09		
Within					
Attractiveness	3	433.40	144.47	47.84*	.0001
Attractiveness x context	12	26.25	2.19	.72	.7249
Attractiveness x order	3	19.19	6.40	2.12	.1003
Attractiveness x context x order	12	18.66	1.56	.52	.9014
Att. x subjects(context x order)	114	344.25	3.02		
Replication	1	11.34	11.34	20.95*	.0001
Replication x context	4	3.34	.84	1.54	.2091
Replication x order	1	.84	.84	1.56	.2195
Replication x context x order	4	3.14	.79	1.45	.2361
Rep. x subjects(context x order)	38	20.58	.54		
Attractiveness x replication	3	.55	.18	.42	.7447
Attractiveness x rep. x context	12	4.74	.40	.89	.5553
Attractiveness x rep. x order	3	.97	.32	.73	.5386
Att. x rep. x context x order	12	7.17	.60	1.35	.1990
Att. x rep. x s(context x order)	114	50.33	.44		
	383	1229.83			

$^{*}p < .05$

(-.28 for the first replication and .07 for the second replication), there were no significant interactions with the planned comparisons.

Warranty. The analysis of variance is summarized in Table A4-18. There was a significant atttractiveness x replication x order x context interaction. The simple attractiveness x order x context interactions are summarized in Table A4-19. This interaction was significant only for the first replication. The simple attractiveness x context interactions for the first replication are summarized in Table A4-20. This interaction was significant only when the one-attribute context was presented first. Therefore the significant difference in linear trend between contexts indicated by the planned comparisons did not occur for the first replication when the one-attribute context was presented first.

Shelf space. The analysis of variance is summarized in Table A4-21. There were significant replication x context, replication x order, and replication x attractiveness interactions. The simple effects of context, order, and attractiveness are summarized in Table A4-22. The simple effects of order were nonsignificant for both replications, while the simple effects of attractiveness were significant for both replications. As the main effect of attractiveness is of little interest, no pairwise comparisons of attractiveness means were conducted.

The simple effect of context was significant only for the first replication. These results indicate that although the planned comparisons indicated no main effect of context, there was a significant effect of context for the first replication.

Table A4-18
Analysis of Variance
Refrigerator Evaluations Based on Warranty

Source	_df_	_SS_	_MS_	_F_	_p_
Between					
Context	1	12.80	12.80	2.03	.1759
Order	1	5.44	5.44	.86	.3683
Context x order	1	9.57	9.57	1.52	.2381
Subjects(context x order)	14	88.19	6.30		
Within					
Attractiveness	3	314.58	104.86	42.49*	.0001
Attractiveness x context	3	35.54	11.85	4.80*	.0058
Attractiveness x order	3	9.27	3.09	1.25	.3028
Attractiveness x context x order	3	14.68	4.89	1.98	.1311
Att. x subjects(context x order)	42	103.66	2.47		
Replication	1	.69	.69	3.69	.0755
Replication x context	1	.17	.17	.89	.3609
Replication x order	1	.11	.11	.59	.4553
Replication x context x order	1	.14	.14	.74	.4050
Rep. x subjects(context x order)	14	2.64	.19		
Attractiveness x replication	3	3.58	1.19	4.73*	.0062
Attractiveness x rep. x context	3	2.28	.76	3.01*	.0408
Attractiveness x rep. x order	3	1.39	.46	1.83	.1560
Att. x rep. x context x order	3	2.39	.80	3.15*	.0348
Att. x rep. x s(context x order)	42	10.61	.25		
	143	617.75			

*$p < .05$

Table A4-19
Simple Attractiveness x Context x Order Interactions
Refrigerator Evaluations Based on Warranty

Source	*df*	*SS*	*MS*	*F*	*p*
Replication 1					
Attractiveness x context x order	3	14.29	4.76	3.76*	.0177
Att. x subjects(context x order)	42	53.21	1.27		
Replication 2					
Attractiveness x context x order	3	2.79	.93	.64	.5944
Att. x subjects(context x order)	42	61.06	1.45		

$^*p < .05$

Table A4-20
Simple Attractiveness x Context Interactions for First Replication
Refrigerator Evaluations Based on Warranty

Source	*df*	*SS*	*MS*	*F*	*p*
Order 1					
Attractiveness x context	3	32.20	10.74	11.29*	.0001
Att. x subjects(context x order)	21	19.96	.95		
Order 2					
Attractiveness x context	3	5.97	1.99	1.26	.3145
Att. x subjects(context x order)	21	33.25	1.58		

$^*p < .05$

Table A4-21
Analysis of Variance
Refrigerator Evaluations Based on Shelf Space

Source	*df*	*SS*	*MS*	*F*	*p*
Between					
Context	1	29.40	29.40	4.24	.0587
Order	1	5.44	5.44	.78	.3907
Context x order	1	.01	.01	0.00	.9723
Subjects(context x order)	14	97.14	6.94		
Within					
Attractiveness	3	335.50	111.83	92.04*	.0001
Attractiveness x context	3	43.86	14.62	12.03*	.0001
Attractiveness x order	3	2.61	.87	.72	.5478
Attractiveness x context x order	3	1.00	.33	.27	.8439
Att. x subjects(context x order)	42	51.03	1.22		
Replication	1	7.11	7.11	13.02*	.0028
Replication x context	1	3.54	3.54	6.49*	.0233
Replication x order	1	2.78	2.78	5.09*	.0406
Replication x context x order	1	.43	.43	.78	.3923
Rep. x subjects(context x order)	14	7.64	.55		
Attractiveness x replication	3	5.50	1.83	5.37*	.0032
Attractiveness x rep. x context	3	2.81	.94	2.74	.0549
Attractiveness x rep. x order	3	.39	.13	.38	.7680
Att. x rep. x context x order	3	1.47	.49	1.44	.2457
Att. x rep. x s(context x order)	42	14.33	.34		
	143	612.00			

*$p < .05$

Table A4-22
Simple Effects of Context, Order, and Attractiveness
Refrigerator Evaluations Based on Shelf Space

Source	*df*	*SS*	*MS*	*F*	*p*
Replication 1					
Context	1	26.68	26.68	6.06*	.0274
Order	1	.22	.22	.05	.8254
Subjects(context x order)	14	61.60	4.40		
Attractiveness	3	146.89	48.96	75.33*	.0001
Att. x subjects(context x order)	42	27.30	.65		
Replication 2					
Context	1	6.27	6.27	2.03	.1760
Order	1	8.00	8.00	2.59	.1296
Subjects(context x order)	14	43.19	3.08		
Attractiveness	3	194.11	64.70	71.40*	.0001
Att. x subjects(context x order)	42	38.06	.91		

$^*p < .05$

Energy cost. The analysis of variance is summarized in Table A4-23. There was a significant attractiveness x replication x context interaction. The simple attractiveness x context interactions are summarized in Table A4-24. The interaction was nonsignificant for both replications. These results are consistent with the planned comparisons, which indicated that there were no significant differences in linear and quadratic trends between contexts.

Price. The analysis of variance is summarized in Table A4-25. There were no significant replication or order effects.

Carpet Cleaner Product Class

Area cleaned. The analysis of variance is summarized in Table A4-26. Although there was a significant main effect of replications, with evaluations being more favorable on the second replication (-.31 for the first replication and -.04 for the second replication), there were no significant interactions with the planned comparisons.

Versatility. The analysis of variance is summarized in Table A4-27. There was a significant attractiveness x order interaction. The simple effects of attractiveness, summarized in Table A4-28, were significant for both orders. As the main effect of attractiveness is of little interest, pairwise comparisons of attractiveness means were not examined.

Tank capacity. The analysis of variance is summarized in Table A4-29. There was a significant attractiveness x order interaction. The simple effects of attractiveness, summarized in Table A4-30, were significant for both orders. Pairwise comparisons of attractiveness means were not examined.

Table A4-23
Analysis of Variance
Refrigerator Evaluations Based on Energy Cost

Source	*df*	*SS*	*MS*	*F*	*p*
Between					
Context	1	.43	.43	.18	.6804
Order	1	.84	.84	.35	.5637
Context x order	1	4.13	4.13	1.72	.2112
Subjects(context x order)	14	33.64	2.40		
Within					
Attractiveness	3	475.08	158.36	140.97*	.0001
Attractiveness x context	3	.87	.29	.26	.8550
Attractiveness x order	3	.91	.30	.27	.8467
Attractiveness x context x order	3	1.09	.36	.32	.8090
Att. x subjects(context x order)	42	47.18	1.12		
Replication	1	2.51	2.51	5.32*	.0368
Replication x context	1	1.56	1.56	3.31	.0903
Replication x order	1	.17	.17	.37	.5535
Replication x context x order	1	.04	.04	.09	.7696
Rep. x subjects(context x order)	14	6.59	.47		
Attractiveness x replication	3	5.13	1.71	3.32*	.0287
Attractiveness x rep. x context	3	5.86	1.95	3.80*	.0170
Attractiveness x rep. x order	3	1.24	.41	.80	.4984
Att. x rep. x context x order	3	.75	.25	.49	.6925
Att. x rep. x s(context x order)	42	21.63	.52		
	143	609.66			

$^*p < .05$

Table A4-24
Simple Attractiveness x Context Interactions
Refrigerator Evaluations Based on Energy Cost

Source	df	SS	MS	F	p
Replication 1					
Attractiveness x context	3	2.92	.97	1.64	.1946
Att. x subjects(context x order)	42	24.90	.59		
Replication 2					
Attractiveness x context	3	3.82	1.27	1.22	.3152
Att. x subjects(context x order)	42	43.91	1.05		

Table A4-25
Analysis of Variance
Refrigerator Evaluations Based on Price

Source	*df*	*SS*	*MS*	*F*	*p*
Between					
Context	1	8.02	8.02	1.50	.2405
Order	1	9.51	9.51	1.78	.2034
Context x order	1	.01	.01	0.00	.9747
Subjects(context x order)	14	74.75	5.34		
Within					
Attractiveness	3	155.58	51.86	15.69*	.0001
Attractiveness x context	3	13.29	4.43	1.34	.2742
Attractiveness x order	3	7.52	2.51	.76	.5237
Attractiveness x context x order	3	6.69	2.23	.67	.5722
Att. x subjects(context x order)	42	138.80	3.30		
Replication	1	1.17	1.17	1.63	.2229
Replication x context	1	.09	.09	.12	.7308
Replication x order	1	1.56	1.56	2.17	.1632
Replication x context x order	1	.20	.20	.28	.6068
Rep. x subjects(context x order)	14	10.10	.72		
Attractiveness x replication	3	1.19	.40	1.38	.2621
Attractiveness x rep. x context	3	.03	.01	.03	.9932
Attractiveness x rep. x order	3	.58	.19	.67	.5754
Att. x rep. x context x order	3	1.54	.51	1.78	.1648
Att. x rep. x s(context x order)	42	12.05	.29		
	143	442.66			

*$p < .05$

Table A4-26
Analysis of Variance
Carpet Cleaner Evaluations Based on Area Cleaned

Source	df	SS	MS	F	p
Between					
Context	4	9.63	2.41	.53	.7172
Order	1	.84	.84	.18	.6701
Context x order	4	4.74	1.19	.26	.9023
Subjects(context x order)	38	173.94	4.58		
Within					
Attractiveness	3	621.01	207.00	75.04*	.0001
Attractiveness x context	12	77.74	6.48	2.37*	.0091
Attractiveness x order	3	17.09	5.70	2.09	.1042
Attractiveness x context x order	12	16.49	1.37	.50	.9087
Att. x subjects(context x order)	114	311.16	2.73		
Replication	1	7.04	7.04	14.67*	.0005
Replication x context	4	1.20	.30	.62	.6490
Replication x order	1	.38	.38	.78	.3823
Replication x context x order	4	2.65	.66	1.38	.2590
Rep. x subjects(context x order)	38	18.24	.48		
Attractiveness x replication	3	2.15	.72	1.65	.1805
Attractiveness x rep. x context	12	2.49	.21	.48	.9237
Attractiveness x rep. x order	3	.65	.22	.50	.6897
Att. x rep. x context x order	12	1.75	.15	.34	.9807
Att. x rep. x s(context x order)	114	49.46	.43		
	383	1318.66			

*$p < .05$

Table A4-27
Analysis of Variance
Carpet Cleaner Evaluations Based on Versatility

Source	*df*	*SS*	*MS*	*F*	*p*
Between					
Context	1	29.61	29.61	4.29	.0574
Order	1	.44	.44	.06	.8034
Context x order	1	24.57	24.57	3.56	.0802
Subjects(context x order)	14	96.69	6.91		
Within					
Attractiveness	3	233.06	77.69	31.11*	.0001
Attractiveness x context	3	24.42	8.14	3.26*	.0307
Attractiveness x order	3	23.72	7.91	3.17*	.0341
Attractiveness x context x order	3	17.19	5.73	2.30	.0917
Att. x subjects(context x order)	42	104.86	2.50		
Replication	1	.11	.11	.15	.7079
Replication x context	1	1.70	1.70	2.24	.1568
Replication x order	1	0.00	0.00	0.00	1.0000
Replication x context x order	1	1.80	1.80	2.37	.1461
Rep. x subjects(context x order)	14	10.64	.76		
Attractiveness x replication	3	1.17	.39	.52	.6686
Attractiveness x rep. x context	3	2.05	.68	.92	.4406
Attractiveness x rep. x order	3	1.72	.57	.77	.5159
Att. x rep. x context x order	3	4.60	1.53	2.06	.1194
Att. x rep. x s(context x order)	42	31.21	.74		
	143	609.56			

*p < .05

Table A4-28
Simple Attractiveness x Order Interactions
Carpet Cleaner Evaluations Based on Versatility

Source	*df*	*SS*	*MS*	*F*	*p*
Order 1					
Attractiveness	3	79.33	26.44	8.09*	.0009
Att. x subjects(context x order)	21	68.68	3.27		
Order 2					
Attractiveness	3	177.44	59.15	34.33*	.0001
Att. x subjects(context x order)	21	36.18	1.72		

*$p < .05$

Table A4-29
Analysis of Variance
Carpet Cleaner Evaluations Based on Tank Capacity

Source	_df_	_SS_	_MS_	_F_	_p_
Between					
Context	1	15.75	15.75	5.96*	.0285
Order	1	.34	.34	.13	.7251
Context x order	1	3.98	3.98	1.50	.2402
Subjects(context x order)	14	36.99	2.64		
Within					
Attractiveness	3	185.19	61.73	27.50*	.0001
Attractiveness x context	3	16.36	5.45	2.43	.0786
Attractiveness x order	3	19.24	6.41	2.86*	.0483
Attractiveness x context x order	3	2.30	.77	.34	.7950
Att. x subjects(context x order)	42	94.28	2.24		
Replication	1	1.56	1.56	3.15	.0976
Replication x context	1	1.65	1.65	3.33	.0893
Replication x order	1	.17	.17	.35	.5635
Replication x context x order	1	.29	.29	.59	.4556
Rep. x subjects(context x order)	14	6.94	.50		
Attractiveness x replication	3	.91	.30	.69	.5649
Attractiveness x rep. x context	3	1.19	.40	.90	.4508
Attractiveness x rep. x order	3	.63	.21	.48	.6997
Att. x rep. x context x order	3	.61	.20	.46	.7085
Att. x rep. x s(context x order)	42	18.53	.44		
	143	406.94			

*$p < .05$

Table A4-30
Simple Attractiveness x Order Interactions
Carpet Cleaner Evaluations Based on Tank Capacity

Source	*df*	*SS*	*MS*	*F*	*p*
Order 1					
Attractiveness	3	44.38	14.79	5.86*	.0045
Att. x subjects(context x order)	21	53.05	2.53		
Order 2					
Attractiveness	3	160.06	53.35	27.17*	.0001
Att. x subjects(context x order)	21	41.23	1.96		

*$p < .05$

Weight. The analysis of variance is summarized in Table A4-31. There were no significant order or replication effects.

Price. The analysis of variance is summarized in Table A4-32. There were significant replication x context and replication x attractiveness interactions. The simple effects of context and attractiveness are summarized in Table A4-33. The simple effects of attractiveness were significant for both replications. Pairwise comparisons of attractiveness means were not conducted.

The effects of context were nonsignificant for both replications. As planned comparisons indicated no main effect of context, these results do not change the interpretation of the planned comparisons.

Summary

These analyses provide little evidence that the planned comparisons are misleading in their characterization of the data. For evaluations based on refrigerator warranty, the significant difference in linear trend between the one- and two-attribute contexts was not significant for one replication and order condition. For evaluations based on refrigerator shelf space, the nonsignificant effect of context was significant for one replication. Otherwise, no interactions involving order or replication indicated that the interpretation of the planned comparisons should be altered.

Table A4-31
Analysis of Variance
Carpet Cleaner Evaluations Based on Weight

Source	_df_	_SS_	_MS_	_F_	_p_
Between					
Context	1	33.58	33.58	6.61*	.0222
Order	1	.34	.34	.07	.7996
Context x order	1	7.30	7.30	1.44	.2506
Subjects(context x order)	14	71.14	5.08		
Within					
Attractiveness	3	191.52	63.84	26.28*	.0001
Attractiveness x context	3	28.95	9.65	3.97*	.0140
Attractiveness x order	3	5.30	1.77	.73	.5416
Attractiveness x context x order	3	3.32	1.11	.46	.7145
Att. x subjects(context x order)	42	102.03	2.43		
Replication	1	.34	.34	.73	.4061
Replication x context	1	.10	.10	.22	.6490
Replication x order	1	1.56	1.56	3.37	.0878
Replication x context x order	1	.38	.38	.82	.3819
Rep. x subjects(context x order)	14	6.49	.46		
Attractiveness x replication	3	1.08	.36	1.06	.3783
Attractiveness x rep. x context	3	1.25	.42	1.22	.3140
Attractiveness x rep. x order	3	.52	.17	.51	.6772
Att. x rep. x context x order	3	.50	.17	.49	.6903
Att. x rep. x s(context x order)	42	14.28	.34		
	143	469.99			

*$p < .05$

Table A4-32
Analysis of Variance
Carpet Cleaner Evaluations Based on Price

Source	df	SS	MS	F	p
Between					
Context	1	0.00	0.00	0.00	.9926
Order	1	14.06	14.06	3.57	.0797
Context x order	1	6.33	6.33	1.61	.2256
Subjects(context x order)	14	55.14	3.94		
Within					
Attractiveness	3	225.74	75.25	16.33*	.0001
Attractiveness x context	3	37.00	12.33	2.68	.0593
Attractiveness x order	3	13.24	4.41	.96	.4216
Attractiveness x context x order	3	2.05	.68	.15	.9301
Att. x subjects(context x order)	42	193.58	4.61		
Replication	1	.84	.84	4.86*	.0446
Replication x context	1	.98	.98	5.65*	.0323
Replication x order	1	.06	.06	.36	.5571
Replication x context x order	1	.08	.08	.45	.5122
Rep. x subjects(context x order)	14	2.42	.17		
Attractiveness x replication	3	2.69	.90	3.39*	.0267
Attractiveness x rep. x context	3	1.78	.59	2.25	.0966
Attractiveness x rep. x order	3	1.69	.56	2.13	.1111
Att. x rep. x context x order	3	.86	.29	1.08	.3666
Att. x rep. x s(context x order)	42	11.11	.26		
	143	569.66			

*$p < .05$

Table A4-33
Simple Effects of Context and Attractiveness
Carpet Cleaner Evaluations Based on Price

Source	*df*	*SS*	*MS*	*F*	*p*
Replication 1					
Context	1	.47	.47	.22	.6495
Subjects(context x order)	14	30.48	2.18		
Attractiveness	3	103.49	34.50	14.13*	.0001
Att. x subjects(context x order)	42	102.53	2.44		
Replication 2					
Context	1	.51	.51	.26	.6170
Subjects(context x order)	14	27.09	1.93		
Attractiveness	3	124.94	41.65	17.12*	.0001
Att. x subjects(context x order)	42	102.16	2.43		

*$p < .05$

APPENDIX V
SUPPLEMENTARY TABLES AND ANALYSES FOR EXPERIMENT II

Two-Attribute Product Sets for Each Information Context*

Refrigerator Capacity and Warranty

Consistent Context (zero correlation)	Inconsistent Context (negative correlation)
4 cu. ft. capacity 4 months warranty	4 cu. ft. capacity 2 years warranty
4.5 cu. ft. capacity 19 months warranty	4.5 cu. ft. capacity 25 months warranty
6 cu. ft. capacity 2 months warranty	6 cu. ft. capacity 18 months warranty
6.5 cu. ft. capacity 25 months warranty	6.5 cu. ft. capacity 19 months warranty
18 cu. ft. capacity 2 years warranty	18 cu. ft. capacity 4 months warranty
18.5 cu. ft. capacity 3 months warranty	18.5 cu. ft. capacity 5 months warranty
25 cu. ft. capacity 18 months warranty	25 cu. ft. capacity 2 months warranty
25.5 cu. ft. capacity 5 months warranty	25.5 cu. ft. capacity 3 months warranty

*Some attribute descriptions are shortened to save space

Refrigerator Capacity and Shelf Space

Consistent Context (zero correlation)	Inconsistent Context (negative correlation)
4 cu. ft. capacity 1 full shelf, no door shelves	4 cu. ft. capacity 2 full shelves, no door shelves
4.5 cu. ft. capacity 1 full shelf, 1/2 door shelf	4.5 cu. ft. capacity 3 full shelves, 2 1/2 door shelves
6 cu. ft. capacity 2 full shelves, no door shelves	6 cu. ft. capacity 4 full shelves, 3 door shelves
6.5 cu. ft. capacity 2 full shelves, 1/2 door shelf	6.5 cu. ft. capacity 1 full shelf, 1/2 door shelf
18 cu. ft. capacity 3 full shelves, 2 door shelves	18 cu. ft. capacity 1 full shelf, no door shelves
18.5 cu. ft. capacity 3 full shelves, 2 1/2 door shelves	18.5 cu. ft. capacity 4 full shelves, 3 1/2 door shelves
25 cu. ft. capacity 4 full shelves, 3 door shelves	25 cu. ft. capacity 3 full shelves, 2 door shelves
25.5 cu. ft. capacity 4 full shelves, 3 1/2 door shelves	25.5 cu. ft. capacity 2 full shelves, 1/2 door shelf

Refrigerator Capacity and Energy Cost

Consistent Context (zero correlation)	Inconsistent Context (negative correlation)
4 cu. ft. capacity $2/month average energy cost	4 cu. ft. capacity $6/month average energy cost
4.5 cu. ft. capacity $3/month average energy cost	4.5 cu. ft. capacity $13/month average energy cost
6 cu. ft. capacity $6/month average energy cost	6 cu. ft. capacity $20/month average energy cost
6.5 cu. ft. capacity $7/month average energy cost	6.5 cu. ft. capacity $3/month average energy cost
18 cu. ft. capacity $12/month average energy cost	18 cu. ft. capacity $2/month average energy cost
18.5 cu. ft. capacity $13/month average energy cost	18.5 cu. ft. capacity $21/month average energy cost
25 cu. ft. capacity $20/month average energy cost	25 cu. ft. capacity $12/month average energy cost
25.5 cu. ft. capacity $21/month average energy cost	25.5 cu. ft. capacity $7/month average energy cost

Refrigerator Capacity and Price

Consistent Context (zero correlation)	Inconsistent Context (negative correlation)
4 cu. ft. capacity $350 price	4 cu. ft. capacity $500 price
4.5 cu. ft. capacity $360 price	4.5 cu. ft. capacity $1210 price
6 cu. ft. capacity $500 price	6 cu. ft. capacity $350 price
6.5 cu. ft. capacity $510 price	6.5 cu. ft. capacity $1610 price
18 cu. ft. capacity $1200 price	18 cu. ft. capacity $1600 price
18.5 cu. ft. capacity $1210 price	18.5 cu. ft. capacity $360 price
25 cu. ft. capacity $1600 price	25 cu. ft. capacity $1200 price
25.5 cu. ft. capacity $1610 price	25.5 cu. ft. capacity $510 price

Carpet Cleaner Area Cleaned and Versatility

Consistent Context (zero correlation)	Inconsistent Context (negative correlation)
cleans .25 average sized room only for short pile synthetic carpets	cleans .25 average sized room for all carpets and rugs
cleans .35 average sized room for most carpets and rugs	cleans .35 average sized room for all carpet types
cleans .75 average sized room only for outdoor type carpets	cleans .75 average sized room for most carpets
cleans .85 average sized room for all carpet types	cleans .85 average sized room for most carpets and rugs
cleans 2.25 average sized rooms for all carpets and rugs	cleans 2.25 average sized rooms only for short pile synthetic carpets
cleans 2.35 average sized rooms only for outdoor type carpets	cleans 2.35 average sized rooms only for short weave synthetic carpets
cleans 3.00 average sized rooms for most carpets	cleans 3.00 average sized rooms only for outdoor type carpets
cleans 3.10 average sized rooms only for short weave synthetic carpets	cleans 3.10 average sized rooms only for outdoor type carpets

Carpet Cleaner Area Cleaned and Tank Capacity

Consistent Context (zero correlation)	Inconsistent Context (negative correlation)
cleans .25 average sized room extra small tank holds .3 gal.	cleans .25 average sized room medium tank holds 1.5 gal.
cleans .35 average sized room extra small tank holds .4 gal.	cleans .35 average sized room small tank holds 1.6 gal.
cleans .75 average sized room small tank holds .5 gal.	cleans .75 average sized room large tank holds 2.0 gal.
cleans .85 average sized room small tank holds .6 gal.	cleans .85 average sized room extra small tank holds .4 gal.
cleans 2.25 average sized rooms medium tank holds 1.5 gal.	cleans 2.25 average sized rooms extra small tank holds .3 gal.
cleans 2.35 average sized rooms medium tank holds 1.6 gal.	cleans 2.35 average sized rooms large tank holds 2.1 gal.
cleans 3.00 average sized rooms large tank holds 2.0 gal.	cleans 3.00 average sized rooms small tank holds .5 gal.
cleans 3.10 average sized rooms large tank holds 2.1 gal.	cleans 3.10 average sized rooms medium tank holds 1.6 gal.

Carpet Cleaner Area Cleaned and Weight

Consistent Context (zero correlation)	Inconsistent Context (negative correlation)
cleans .25 average sized room weighs 12 lbs. when tank is full	cleans .25 average sized room weighs 35 lbs. when tank is full
cleans .35 average sized room weighs 11 lbs. when tank is full	cleans .35 average sized room weighs 19 lbs. when tank is full
cleans .75 average sized room weighs 20 lbs. when tank is full	cleans .75 average sized room weighs 50 lbs. when tank is full
cleans .85 average sized room weighs 19 lbs. when tank is full	cleans .85 average sized room weighs 11 lbs. when tank is full
cleans 2.25 average sized rooms weighs 35 lbs. when tank is full	cleans 2.25 average sized rooms weighs 12 lbs. when tank is full
cleans 2.35 average sized rooms weighs 34 lbs. when tank is full	cleans 2.35 average sized rooms weighs 49 lbs. when tank is full
cleans 3.00 average sized rooms weighs 50 lbs. when tank is full	cleans 3.00 average sized rooms weighs 20 lbs. when tank is full
cleans 3.10 average sized rooms weighs 49 lbs. when tank is full	cleans 3.10 average sized rooms weighs 34 lbs. when tank is full

Carpet Cleaner Area Cleaned and Price

Consistent Context (zero correlation)	Inconsistent Context (negative correlation)
cleans .25 average sized room $80 price	cleans .35 average sized room $305 price
cleans .35 average sized room $85 price	cleans .25 average sized room $125 price
cleans .75 average sized room $125 price	cleans .75 average sized room $500 price
cleans .85 average sized room $130 price	cleans .85 average sized room $85 price
cleans 2.25 average sized rooms $300 price	cleans 2.25 average sized rooms $80 price
cleans 2.35 average sized rooms $305 price	cleans 2.35 average sized rooms $505 price
cleans 3.00 average sized rooms $500 price	cleans 3.00 average sized rooms $300 price
cleans 3.10 average sized rooms $505 price	cleans 3.10 average sized rooms $130 price

Range Effects Analysis

Subjects in all information contexts rated identical evaluatively extreme services both before and after rating the products. If the services were more evaluatively extreme than any of the products, then, theoretically, they should have anchored the endpoints of the response scale for all judgments. How successful the services were in anchoring the response scale may be determined by comparing the rating of the services before and after the product rating task. If the services successfully anchored the response scale in all contexts, then ratings of the services should not have changed over the course of the product rating task.

An analysis of variance with information context (one-attribute, two-attribute consistent, and two-attribute inconsistent) and order of presentation (one-attribute context first and two-attribute context first) as between subjects factors and services (extremely unattractive, very unattractive, very attractive, and extremely attractive) and time (before and after product rating task) as within subjects factors was conducted for each known and missing attribute combination.

As described in Chapter VII, the response scale may be assumed to have remained stable over time if the following effects are nonsignificant: main effect of time, time x service interaction, time x context interaction, and time x context x service interaction. Therefore, only these effects and interactions involving these effects were examined. Because it was desirable to establish that these effects were nonsignificant, an alpha level of .10 was adopted.

These analyses, which are described in detail below, indicate that the response scale generally remained fairly stable over time. There is very little evidence of changes in the response scale in the refrigerator product class. Although the response scale appears to have been somewhat less stable in the carpet cleaner product class, there are actually few significant changes in the ratings of services over time. It may be concluded that the services rating task was quite effective in controlling for range effects in the refrigerator product class, and at least moderately effective in controlling for range effects in the carpet cleaner product class.

Refrigerator Product Class

Analyses of variance for the refrigerator product class are summarized in Tables A5-1 through A5-11. The effects of interest were nonsignificant in every case but one. When the known attribute was capacity and energy cost was the missing attribute, there were significant service x time x context and service x time x order interactions. This analysis of variance is summarized in Table A5-3.

Simple time x context interactions for each service are summarized in Table A5-4. The interaction was significant only for the very unattractive service. Simple effects of time for the very unattractive service are summarized in Table A5-5. The simple effects of time were significant only in the two-attribute inconsistent context. In this context, evaluations became more negative following the product rating task. The mean rating prior to the product rating task was -3.20, while the mean rating subsequent to this task was

Table A5-1
Analysis of Variance
Refrigerator Rental Service Evaluations
Information Contexts: Capacity Known, Warranty Missing

Source	*df*	*SS*	*MS*	*F*	*p*
Between					
Context	2	2.76	1.38	.54	.5871
Order	1	.69	.69	.27	.6049
Context x order	2	12.96	6.48	2.53*	.0906
Subjects(context x order)	46	117.77	2.56		
Within					
Service	3	5776.12	1925.37	554.00*	.0001
Service x context	6	15.68	2.61	.75	.6089
Service x order	3	21.20	7.07	2.03	.1105
Service x context x order	6	32.52	5.42	1.56	.1636
Ser. x subjects(context x order)	138	479.61	3.48		
Time	1	1.27	1.27	1.37	.2476
Time x context	2	1.14	.57	.62	.5449
Time x order	1	.12	.12	.13	.7232
Time x context x order	2	1.19	.60	.64	.5297
Time x subjects(context x order)	46	42.65	.93		
Service x time	3	9.47	3.16	1.76	.1563
Service x time x context	6	17.55	2.93	1.63	.1434
Service x time x order	3	6.66	2.22	1.24	.2984
Service x time x context x order	6	17.72	2.95	1.65	.1392
Ser. x time x s(context x ord.)	138	247.73	1.80		
	415	6804.81			

$^*p < .10$

Table A5-2
Analysis of Variance
Refrigerator Rental Service Evaluations
Information Contexts: Capacity Known, Shelf Space Missing

Source	df	SS	MS	F	p
Between					
Context	2	2.99	1.49	.57	.5700
Order	1	.24	.24	.09	.7635
Context x order	2	10.53	5.26	2.01	.1462
Subjects(context x order)	46	120.72	2.62		
Within					
Service	3	6331.01	2110.34	969.93*	.0001
Service x context	6	11.43	1.91	.88	.5146
Service x order	3	24.74	8.25	3.79*	.0120
Service x context x order	6	22.31	3.72	1.71	.1232
Ser. x subjects(context x order)	138	300.26	2.18		
Time	1	.15	.15	.22	.6393
Time x context	2	1.92	.96	1.39	.2595
Time x order	1	.62	.62	.89	.3504
Time x context x order	2	.26	.13	.19	.8294
Time x subjects(context x order)	46	31.80	.69		
Service x time	3	.29	.10	.09	.9586
Service x time x context	6	3.92	.65	.63	.7030
Service x time x order	3	1.87	.62	.60	.6178
Service x time x context x order	6	8.00	1.33	1.29	.2636
Ser. x time x s(context x ord.)	138	142.18	1.03		
	415	7015.22			

*$p < .10$

Table A5-3
Analysis of Variance
Refrigerator Rental Service Evaluations
Information Contexts: Capacity Known, Energy Cost Missing

Source	_df_	_SS_	_MS_	_F_	_p_
Between					
Context	2	1.92	.96	.37	.6906
Order	1	.24	.24	.09	.7612
Context x order	2	10.93	5.46	2.12	.1312
Subjects(context x order)	46	118.32	2.57		
Within					
Service	3	5740.79	1913.60	368.69*	.0001
Service x context	6	86.55	14.43	2.78*	.0139
Service x order	3	9.63	3.21	.62	.6084
Service x context x order	6	76.03	12.67	2.44*	.0283
Ser. x subjects(context x order)	138	716.26	5.19		
Time	1	0.00	0.00	0.00	1.0000
Time x context	2	.68	.34	.51	.6014
Time x order	1	.47	.47	.72	.4013
Time x context x order	2	.90	.45	.69	.5075
Time x subjects(context x order)	46	30.20	.66		
Service x time	3	.13	.04	.05	.9779
Service x time x context	6	9.87	1.65	1.98*	.0723
Service x time x order	3	5.86	1.95	2.35*	.0738
Service x time x context x order	6	4.31	.72	.87	.5219
Ser. x time x s(context x ord.)	138	114.58	.83		
	415	6927.65			

*$p < .10$

Table A5-4
Simple Time x Context Interactions
Refrigerator Rental Service Evaluations
Information Contexts: Capacity Known, Energy Cost Missing

Source	*df*	*SS*	*MS*	*F*	*p*
Extremely Unattractive					
Time x context	2	.41	.21	.22	.8031
Time x subjects(context x order)	46	43.15	.94		
Very Unattractive					
Time x context	2	4.69	2.35	3.31*	.0454
Time x subjects(context x order)	46	32.59	.71		
Very Attractive					
Time x context	2	5.02	2.51	1.96	.1530
Time x subjects(context x order)	46	58.97	1.28		
Extremely Attractive					
Time x context	2	.43	.21	.98	.3846
Time x subjects(context x order)	46	10.07	.22		

*$p < .10$

Table A5-5
Simple Effects of Time for Very Unattractive Service
Refrigerator Rental Service Evaluations
Information Contexts: Capacity Known, Energy Cost Missing

Source	df	SS	MS	F	p
One-Attribute					
Time	1	.25	.25	.62	.4389
Time x subjects(order)	30	12.19	.41		
Two-Attribute Consistent					
Time	1	3.20	3.20	1.38	.2745
Time x subjects(order)	8	18.60	2.33		
Two-Attribute Inconsistent					
Time	1	1.25	1.25	5.56*	.0462
Time x subjects(order)	8	1.80	.23		

*p < .10

Table A5-6
Simple Service x Time Interactions
Refrigerator Rental Service Evaluations
Information Contexts: Capacity Known, Energy Cost Missing

Source	df	SS	MS	F	p
One-Attribute Context First					
Service x time	3	2.75	.92	1.16	.3334
Service x time x s(context)	69	54.66	.79		
Two-Attribute Context First					
Service x time	3	3.25	1.08	1.25	.2996
Service x time x s(context)	69	59.91	.87		

Table A5-7
Analysis of Variance
Refrigerator Rental Service Evaluations
Information Contexts: Capacity Known, Price Missing

Source	df	SS	MS	F	p
Between					
Context	2	5.02	2.51	.97	.3858
Order	1	.09	.09	.03	.8555
Context x order	2	17.65	8.83	3.42*	.0411
Subjects(context x order)	46	118.62	2.58		
Within					
Service	3	6287.11	2095.70	975.88*	.0001
Service x context	6	6.56	1.09	.51	.8007
Service x order	3	48.34	16.11	7.50*	.0001
Service x context x order	6	10.64	1.77	.83	.5517
Ser. x subjects(context x order)	138	296.36	2.15		
Time	1	.47	.47	.71	.4051
Time x context	2	.03	.01	.02	.9786
Time x order	1	.09	.09	.13	.7204
Time x context x order	2	.21	.11	.16	.8527
Time x subjects(context x order)	46	30.70	.67		
Service x time	3	.41	.14	.21	.8899
Service x time x context	6	1.47	.24	.37	.8980
Service x time x order	3	.64	.21	.32	.8106
Service x time x context x order	6	2.30	.38	.58	.7482
Ser. x time x s(context x ord.)	138	91.68	.66		
	415	6918.38			

*p < .10

Table A5-8
Analysis of Variance
Refrigerator Rental Service Evaluations
Information Contexts: Warranty Known, Capacity Missing

Source	_df_	_SS_	_MS_	_F_	_p_
Between					
Context	2	1.37	.69	.25	.7802
Order	1	21.69	21.69	7.89*	.0073
Context x order	2	.82	.41	.15	.8622
Subjects(context x order)	46	126.45	2.75		
Within					
Service	3	5879.53	1959.84	383.78*	.0001
Service x context	6	19.27	3.21	.63	.7068
Service x order	3	13.45	4.48	.88	.4565
Service x context x order	6	9.15	1.53	.30	.9367
Ser. x subjects(context x order)	138	704.73	5.11		
Time	1	0.00	0.00	0.00	.9479
Time x context	2	.37	.19	.33	.7176
Time x order	1	.87	.87	1.56	.2184
Time x context x order	2	.49	.25	.44	.6443
Time x subjects(context x order)	46	25.64	.56		
Service x time	3	1.14	.38	.27	.8495
Service x time x context	6	9.75	1.62	1.14	.3419
Service x time x order	3	.70	.23	.16	.9178
Service x time x context x order	6	11.08	1.85	1.30	.2627
Ser. x time x s(context x order)	138	196.46	1.42		
	415	7022.96			

*$p < .10$

Table A5-9
Analysis of Variance
Refrigerator Rental Service Evaluations
Information Contexts: Shelf Space Known, Capacity Missing

Source	df	SS	MS	F	p
Between					
Context	2	2.05	1.03	.74	.4827
Order	1	.12	.12	.08	.7720
Context x order	2	1.11	.55	.40	.6731
Subjects(context x order)	46	63.79	1.39		
Within					
Service	3	6217.53	2072.51	1022.50*	.0001
Service x context	6	10.77	1.80	.89	.5071
Service x order	3	24.43	8.14	4.02*	.0090
Service x context x order	6	15.93	2.66	1.31	.2567
Ser. x subjects(context x order)	138	279.71	2.03		
Time	1	.29	.29	1.56	.2178
Time x context	2	.24	.12	.64	.5336
Time x order	1	0.00	0.00	.01	.9101
Time x context x order	2	.03	.01	.07	.9334
Time x subjects(context x order)	46	8.57	.19		
Service x time	3	3.14	1.05	1.28	.2841
Service x time x Contex	6	6.29	1.05	1.28	.2709
Service x time x order	3	2.62	.87	1.07	.3663
Service x time x context x order	6	5.16	.86	1.05	.3964
Ser. x time x s(context x order)	138	113.16	.82		
	415	6754.94			

*p < .10

Table A5-10
Analysis of Variance
Refrigerator Rental Service Evaluations
Information Contexts: Energy Cost Known, Capacity Missing

Source	*df*	*SS*	*MS*	*F*	*p*
Between					
Context	2	4.25	2.13	1.51	.2315
Order	1	.04	.04	.03	.8695
Context x order	2	15.35	7.67	5.45*	.0075
Subjects(context x order)	46	64.77	1.41		
Within					
Service	3	5900.43	1966.81	413.24*	.0001
Service x context	6	20.18	3.36	.71	.6447
Service x order	3	8.02	2.67	.56	.6453
Service x context x order	6	7.06	1.18	.25	.9597
Ser. x subjects(context x order)	138	656.80	4.76		
Time	1	.35	.35	.53	.4709
Time x context	2	.84	.42	.64	.5307
Time x order	1	.09	.09	.13	.7179
Time x context x order	2	3.10	1.55	2.37	.1048
Time x subjects(context x order)	46	30.12	.65		
Service x time	3	.83	.28	.16	.9198
Service x time x context	6	14.49	2.42	1.41	.2162
Service x time x order	3	5.16	1.72	1.00	.3949
Service x time x context x order	6	7.11	1.19	.69	.6574
Ser. x time x subjects(context)	138	236.90	1.72		
	415	6975.91			

*$p < .10$

Table A5-11
Analysis of Variance
Refrigerator Rental Service Evaluations
Information Contexts: Price Known, Capacity Missing

Source	*df*	*SS*	*MS*	*F*	*p*
Between					
Context	2	1.36	.68	.57	.5691
Order	1	2.31	2.31	1.94	.1702
Context x order	2	5.27	2.63	2.21	.1209
Subjects(context x order)	46	54.74	1.19		
Within					
Service	3	5667.83	1889.11	323.64*	.0001
Service x context	6	12.65	2.11	.36	.9023
Service x order	3	7.16	2.39	.41	.7503
Service x context x order	6	19.65	3.27	.56	.7607
Ser. x subjects(context x order)	138	805.58	5.84		
Time	1	.12	.12	.38	.5422
Time x context	2	1.11	.56	1.78	.1805
Time x order	1	.12	.12	.38	.5422
Time x context x order	2	.91	.46	1.46	.2434
Time x subjects(context x order)	46	14.37	.31		
Service x time	3	1.12	.37	.23	.8775
Service x time x context	6	2.49	.41	.25	.9584
Service x time x order	3	5.28	1.76	1.06	.3677
Service x time x context x order	6	7.66	1.28	.77	.5937
Ser. x time x s(context x order)	138	228.33	1.65		
	415	6838.06			

$^{*}p < .10$

-3.70. In this context, then, the services did not successfully anchor the response scale.

Simple service x time interactions were also examined for each order. These analyses are summarized in Table A5-6. The simple service x time interaction was nonsignificant for both orders.

Carpet Cleaner Product Class

Analyses for the carpet cleaner product class are summarized in Tables A5-12 through A5-32. In six of the eight cases tested there was some evidence that the response scale changed over time.

Area cleaned known, versatility missing. The analysis of variance is summarized in Table A5-12. There was a significant service x time interaction. The simple effects of time are summarized in Table A5-13. The simple effects of time were significant only for the very attractive service description. This description was rated significantly lower following the product rating task. The mean was 3.65 prior to the rating task and 3.50 afterwards. On the average, then, ratings of this service did change over time.

Area cleaned known, weight missing. The analysis of variance is summarized in Table A5-15. There were significant service x time x context and service x time x order interactions. Simple time x context interactions for each service are summarized in Table A5-16. The interaction was nonsignificant for all services. Simple service x time interactions for each order are summarized in Table A5-17. The interaction was nonsignificant for both orders. Therefore, although the higher order interactions suggest that the response scale did not remain stable over time, followup tests did not uncover any significant differences in the way services were rated over time.

Table A5-12
Analysis of Variance
Carpet Cleaning Service Evaluations
Information Contexts: Area Cleaned Known, Versatility Missing

Source	*df*	*SS*	*MS*	*F*	*p*
Between					
Context	2	.54	.29	.20	.8233
Order	1	.01	.01	.01	.9342
Context x order	2	8.97	4.48	3.22*	.0493
Subjects(context x order)	46	64.13	1.39		
Within					
Service	3	7337.15	2445.72	1402.69*	.0001
Service x context	6	14.27	2.38	1.36	.2335
Service x order	3	12.11	4.04	2.36*	.0773
Service x context x order	6	14.36	2.39	1.37	.2300
Ser. x subjects(context x order)	138	240.62	1.74		
Time	1	.24	.24	.42	.5217
Time x context	2	.45	.22	.39	.6808
Time x order	1	.35	.35	.60	.4424
Time x context x order	2	.44	.22	.39	.6823
Time x subjects(context x order)	46	26.52	.58		
Service x time	3	1.95	.65	2.44*	.0656
Service x time x context	6	.35	.05	.22	.9706
Service x time x order	3	1.12	.37	1.40	.2456
Service x time x context x order	6	1.83	.31	1.15	.3390
Ser. x time x subjects(context)	138	36.75	.27		
	415	7762.15			

*p < .10

Table A5-13
Simple Effects of Time
Carpet Cleaning Service Evaluations
Information Contexts: Area Cleaned Known, Versatility Missing

Source	*df*	*SS*	*MS*	*F*	*p*
Extremely Unattractive					
Time	1	1.38	1.38	1.99	.1648
Time x subjects(context x order)	46	31.97	.70		
Very Unattractive					
Time	1	.15	.15	.71	.4038
Time x subjects(context x order)	46	9.97	.22		
Very Attractive					
Time	1	.62	.62	4.18*	.0466
Time x subjects(context x order)	46	6.77	.15		
Extremely Attractive					
Time	1	.04	.04	.12	.7291
Time x subjects(context x order)	46	14.57	.32		

*p < .10

Table A5-14
Analysis of Variance
Carpet Cleaning Service Evaluations
Information Contexts: Area Cleaned Known, Tank Capacity Missing

Source	_df_	_SS_	_MS_	_F_	_p_
Between					
Context	2	1.88	.93	.84	.4401
Order	1	.29	.29	.26	.6132
Context x order	2	3.32	1.66	1.48	.2384
Subjects(context x order)	46	51.63	1.12		
Within					
Service	3	7682.39	2560.80	2174.50*	.0001
Service x context	6	8.44	1.41	1.19	.3127
Service x order	3	2.35	.78	.67	.5780
Service x context x order	6	12.42	2.07	1.76	.1722
Ser. x subjects(context x order)	138	162.52	1.18		
Time	1	.87	.87	1.49	.2287
Time x context	2	.01	0.00	.01	.9938
Time x order	1	1.50	1.50	2.58	.1153
Time x context x order	2	.18	.09	.15	.8605
Time x subjects(context x order)	46	26.82	.58		
Service x time	3	.51	.17	.54	.6619
Service x time x context	6	2.96	.49	1.56	.1621
Service x time x order	3	.18	.06	.19	.9007
Service x time x context x order	6	3.03	.50	1.60	.1507
Ser. x time x s(context x order)	138	43.45	.31		
	415	8004.75			

*p < .10

Table A5-15
Analysis of Variance
Carpet Cleaning Service Evaluations
Information Contexts: Area Cleaned Known, Weight Missing

Source	df	SS	MS	F	p
Between					
Context	2	2.70	1.35	.72	.4916
Order	1	.15	.15	.08	.7757
Context x order	2	5.30	2.65	1.41	.2537
Subjects(context x order)	46	86.18	1.87		
Within					
Service	3	7060.09	2353.36	913.37*	.0001
Service x context	6	12.66	2.11	.82	.5570
Service x order	3	3.79	1.26	.49	.6937
Service x context x order	6	8.40	1.40	.54	.7745
Ser. x subjects(context x order)	138	355.57	2.58		
Time	1	.96	.96	1.16	.2867
Time x context	2	.40	.20	.24	.7859
Time x order	1	1.63	1.63	1.96	.1679
Time x context x order	2	.94	.47	.57	.5704
Time x subjects(context x order)	46	38.07	.83		
Service x time	3	2.79	.93	.91	.4401
Service x time x context	6	11.24	1.87	1.83*	.0970
Service x time x order	3	7.43	2.48	2.42*	.0672
Service x time x context x order	6	9.54	1.59	1.56	.1646
Ser. x time x s(context x order)	138	141.00	1.02		
	415	7748.84			

*p < .10

Table A5-16
Simple Time x Context Interactions
Carpet Cleaning Service Evaluations
Information Contexts: Area Cleaned Known, Weight Missing

Source	*df*	*SS*	*MS*	*F*	*p*
Extremely Unattractive					
Time x context	2	6.44	3.22	1.51	.2319
Time x subjects(context x order)	46	98.17	2.13		
Very Unattractive					
Time x context	2	1.16	.58	1.23	.3009
Time x subjects(context x order)	46	21.57	.47		
Very Attractive					
Time x context	2	.80	.40	1.78	.1795
Time x subjects(context x order)	46	10.37	.23		
Extremely Attractive					
Time x context	2	3.24	1.62	1.52	.2294
Time x subjects(context x order)	46	48.97	1.06		

Table A5-17
Simple Time x Context Interactions
Carpet Cleaning Service Evaluations
Information Contexts: Area Cleaned Known, Weight Missing

Source	*df*	*SS*	*MS*	*F*	*p*
One-Attribute Context First					
Service x time	3	8.63	2.88	1.75	.1633
Ser. x time x subjects(context)	69	113.41	1.62		
Two-Attribute Context First					
Service x time	3	1.59	.53	1.33	.2721
Ser. x time x subjects(context)	69	27.59	.40		

Table A5-18
Analysis of Variance
Carpet Cleaning Service Evaluations
Information Contexts: Area Cleaned Known, Price Missing

Source	*df*	*SS*	*MS*	*F*	*p*
Between					
Context	2	2.58	1.29	.68	.5121
Order	1	3.66	3.66	1.93	.1717
Context x order	2	3.91	1.95	1.03	.3651
Subjects(context x order)	46	87.23	1.90		
Within					
Service	3	6859.89	2286.63	736.39*	.0001
Service x context	6	41.64	6.94	2.24*	.0433
Service x order	3	19.49	6.50	2.09	.1025
Service x context x order	6	42.34	7.05	2.27*	.0401
Ser. x subjects(context x order)	138	428.52	3.11		
Time	1	.19	.19	.28	.5971
Time x context	2	.48	.24	.35	.7070
Time x order	1	.02	.02	.03	.8600
Time x context x order	2	1.81	.90	1.31	.2787
Time x subjects(context x order)	46	31.62	.69		
Service x time	3	8.41	2.80	2.42*	.0676
Service x time x context	6	24.45	4.08	3.52*	.0029
Service x time x order	3	1.58	.53	.46	.7174
Service x time x context x order	6	5.08	.85	.73	.6260
Ser. x time x s(context x order)	138	159.85	1.16		
	415	7722.75			

*p < .10

Table A5-19
Simple Time x Context Interactions
Carpet Cleaning Service Evaluations
Information Contexts: Area Cleaned Known, Price Missing

Source	df	SS	MS	F	p
Extremely Unattractive					
Time x context	2	2.59	1.29	1.25	.2973
Time x subjects(context x order)	46	47.77	1.04		
Very Unattractive					
Time x context	2	6.11	3.06	2.85*	.0683
Time x subjects(context x order)	46	49.37	1.07		
Very Attractive					
Time x context	2	1.73	.86	1.95	.1538
Time x subjects(context x order)	46	20.37	.44		
Extremely Attractive					
Time x context	2	14.51	7.25	4.51*	.0163
Time x subjects(context x order)	46	73.97	1.61		

*$p < .10$

Table A5-20
Simple Effects of Time for Very Unattractive Service
Carpet Cleaning Service Evaluations
Information Contexts: Area Cleaned Known, Price Missing

Source	df	SS	MS	F	p
One-Attribute					
Time	1	.39	.39	1.47	.2347
Time x subject	30	7.97	.27		
Two-Attribute Consistent					
Time	1	8.45	8.45	1.65	.2351
Time x subject	8	41.00	5.13		
Two-Attribute Inconsistent					
Time	1	.05	.05	1.00	.3466
Time x subject	8	.40	.05		

Table A5-21
Simple Effects of Time for Extremely Attractive Service
Carpet Cleaning Service Evaluations
Information Contexts: Area Cleaned Known, Price Missing

Source	df	SS	MS	F	p
One-Attribute					
Time	1	.14	.14	.53	.4725
Time x subject	30	7.97	.27		
Two-Attribute Consistent					
Time	1	16.20	16.20	1.98	.1975
Time x subject	8	65.60	8.20		
Two-Attribute Inconsistent					
Time	1	.05	.05	1.00	.3466
Time x subject	8	.40	.05		

Table A5-22
Analysis of Variance
Carpet Cleaning Service Evaluations
Information Contexts: Versatility Known, Area Cleaned Missing

Source	*df*	*SS*	*MS*	*F*	*p*
Between					
Context	2	2.85	1.43	1.26	.2937
Order	1	1.16	1.16	1.03	.3162
Context x order	2	1.82	.91	.80	.4533
Subjects(context x order)	46	52.12	1.13		
Within					
Service	3	6557.79	2185.93	641.51*	.0001
Service x context	6	2.88	.48	.14	.9905
Service x order	3	4.66	1.55	.46	.7172
Service x context x order	6	8.44	1.41	.41	.8695
Ser. x subjects(context x order)	138	470.23	3.41		
Time	1	.78	.78	1.90	.1752
Time x context	2	1.84	.92	2.24	.1184
Time x order	1	.35	.35	.84	.3634
Time x context x order	2	.14	.07	.17	.8425
Time x subjects(context x order)	46	18.90	.41		
Service x time	3	20.74	6.91	4.63*	.0042
Service x time x context	6	4.04	.67	.45	.8438
Service x time x order	3	11.10	3.70	2.47*	.0631
Service x time x context x order	6	3.85	.58	.43	.8586
Ser. x time x s(context X order)	138	206.28	1.49		
	415	7369.96			

*$p < .10$

Table A5-23
Simple Service x Time Interactions
Carpet Cleaning Service Evaluations
Information Contexts: Versatility Known, Area Cleaned Missing

Source	*df*	*SS*	*MS*	*F*	*p*
One-Attribute Context First					
Service x time	3	2.21	.74	2.69*	.0524
Ser. x time x subjects(context)	69	18.90	.27		
Two-Attribute Context First					
Service x time	3	29.63	9.88	3.64*	.0169
Ser. x time x subjects(context)	69	187.38	2.72		

**p* < .10

Table A5-24
Simple Effects of Time for First Position
Carpet Cleaning Service Evaluations
Information Contexts: Versatility Known, Area Cleaned Missing

Source	*df*	*SS*	*MS*	*F*	*p*
Extremely Unattractive					
Time	1	3.25	3.25	3.96*	.0588
Time x subjects(context)	23	18.90	.82		
Very Unattractive					
Time	1	0.00	0.00	0.00	1.0000
Time x subjects(context)	23	1.87	.08		
Very Attractive					
Time	1	.02	.02	.17	.6877
Time x subjects(context)	23	2.67	.12		
Extremely Attractive					
Time	1	.02	.02	.19	.6629
Time x subjects(context)	23	2.27	.10		

$^*p < .10$

Table A5-25
Simple Effects of Time for Second Position
Carpet Cleaning Service Evaluations
Information Contexts: Versatility Known, Area Cleaned Missing

Source	*df*	*SS*	*MS*	*F*	*p*
Extremely Unattractive					
Time	1	10.17	10.17	3.17*	.0880
Time x subjects(context)	23	73.70	3.20		
Very Unattractive					
Time	1	5.56	5.56	3.51*	.0738
Time x subjects(context)	23	36.42	1.58		
Very Attractive					
Time	1	10.17	10.17	5.78*	.0246
Time x subjects(context)	23	40.48	1.76		
Extremely Attractive					
Time	1	3.77	3.77	1.77	.1960
Time x subjects(context)	23	48.88	2.13		

*$p < .10$

Table A5-26
Analysis of Variance
Carpet Cleaning Service Evaluations
Information Contexts: Tank Capacity Known, Area Cleaned Missing

Source	*df*	*SS*	*MS*	*F*	*p*
Between					
Context	2	1.12	.56	.81	.4503
Order	1	.19	.19	.28	.5981
Context x order	2	.62	.31	.45	.6423
Subjects(context x order)	46	31.78	.69		
Within					
Service	3	6697.58	2232.53	490.79*	.0001
Service x context	6	88.89	14.82	3.26*	.0050
Service x order	3	.31	.10	.02	.9908
Service x context x order	6	22.09	3.68	.81	.5643
Ser. x subjects(context x order)	138	627.74	4.55		
Time	1	0.00	0.00	0.01	.9391
Time x context	2	.08	.04	.09	.9113
Time x order	1	.02	.02	.05	.8187
Time x context x order	2	.05	.03	.07	.9366
Time x subjects(context x order)	46	18.72	.41		
Service x time	3	7.97	2.66	1.04	.3799
Service x time x context	6	16.35	2.72	1.06	.3884
Service x time x order	3	12.95	4.32	1.68	.1719
Service x time x context x order	6	10.33	1.72	.67	.6731
Ser. x time x s(context x order)	138	354.03	2.57		
	415	7890.84			

*$p < .10$

Table A5-27
Analysis of Variance
Carpet Cleaning Service Evaluations
Information Contexts: Weight Known, Area Cleaned Missing

Source	df	SS	MS	F	p
Between					
Context	2	9.70	4.85	2.19	.1233
Order	1	.01	.01	0.00	.9477
Context x order	2	10.98	5.49	2.48*	.0949
Subjects(context x order)	46	101.82	2.21		
Within					
Service	3	7435.93	2478.64	1253.44*	.0001
Service x context	6	7.75	1.29	.65	.6878
Service x order	3	10.78	3.59	1.82	.1452
Service x context x order	6	5.90	.98	.50	.8094
Ser. x subjects(context x order)	138	272.89	1.98		
Time	1	.62	.62	1.56	.2175
Time x context	2	.55	.28	.70	.5024
Time x order	1	.04	.04	.10	.7560
Time x context x order	2	.94	.47	1.19	.3136
Time x subjects(context x order)	46	18.11	.39		
Service x time	3	.90	.30	2.13*	.0972
Service x time x context	6	1.99	.33	2.35*	.0345
Service x time x order	3	.63	.21	1.50	.2163
Service x time x context x order	6	1.75	.29	2.06*	.0615
Ser. x time x s(context x order)	138	19.48	.14		
	415	7900.76			

*p < .10

Table A5-28
Simple Service x Time x Context Interactions
Carpet Cleaning Service Evaluations
Information Contexts: Weight Known, Area Cleaned Missing

Source	*df*	*SS*	*MS*	*F*	*p*
One-Attribute Context First					
Service x time x context	6	.61	.10	.91	.4926
Ser. x time x subjects(context)	69	7.75	.11		
Two-Attribute Context First					
Service x time x context	6	3.12	.52	3.06*	.0103
Ser. x time x subjects(context)	69	11.73	.17		

$^*p < .10$

Table A5-29
Simple Time x Context Interactions for Second Position
Carpet Cleaning Service Evaluations
Information Contexts: Weight Known, Area Cleaned Missing

Source	*df*	*SS*	*MS*	*F*	*p*
Extremely Unattractive					
Time x context	2	.21	.11	.75	.4854
Time x subjects(context)	23	3.27	.14		
Very Unattractive					
Time x context	2	.85	.42	1.92	.1691
Time x subjects(context)	23	5.08	.22		
Very Attractive					
Time x context	2	1.30	.65	1.40	.2675
Time x subjects(context)	23	10.70	.47		
Extremely Attractive					
Time x context	2	1.22	.61	2.06	.1501
Time x subjects(context)	23	6.80	.30		

Table A5-30
Analysis of Variance
Carpet Cleaning Service Evaluations
Information Contexts: Price Known, Area Cleaned Missing

Source	_df_	_SS_	_MS_	_F_	_p_
Between					
Context	2	1.75	.88	.77	.4695
Order	1	1.75	1.75	1.54	.2213
Context x order	2	3.38	1.69	1.48	.2381
Subjects(context x order)	46	52.43	1.14		
Within					
Service	3	7545.49	2515.16	1139.54*	.0001
Service x context	6	21.52	3.59	1.62	.1447
Service x order	3	22.24	7.41	3.36*	.0206
Service x context x order	6	28.04	4.67	2.12*	.0551
Ser. x subjects(context x order)	138	304.59	2.21		
Time	1	.41	.41	1.03	.3155
Time x context	2	2.87	1.43	3.64*	.0342
Time x order	1	0.00	0.00	.01	.9381
Time x context x order	2	3.20	1.60	4.06*	.0238
Time x subjects(context x order)	46	18.15	.39		
Service x time	3	1.08	.36	1.01	.3927
Service x time x context	6	2.23	.37	1.04	.4033
Service x time x order	3	.60	.20	.56	.6460
Service x time x context x order	6	1.45	.24	.67	.6712
Ser. x time x subjects(context)	138	49.50	.36		
	415	8060.69			

*_p_ < .10

Table A5-31
Simple Time x Context Interactions
Carpet Cleaning Service Evaluations
Information Contexts: Price Known, Area Cleaned Missing

Source	*df*	*SS*	*MS*	*F*	*p*
One-Attribute Context First					
Time x context	2	5.81	2.90	3.97*	.0330
Time x subjects(context)	23	16.83	.73		
Two-Attribute Context First					
Time x context	2	.26	.13	2.27	.1262
Time x subjects(context)	23	1.32	.06		

*p < .10

Table A5-32
Simple Effects of Time for First Position
Carpet Cleaning Service Evaluations
Information Contexts: Price Known, Area Cleaned Missing

Source	*df*	*SS*	*MS*	*F*	*p*
One-Attribute					
Time	1	.20	.20	.27	.6122
Time x subjects	15	10.93	.73		
Two-Attribute Consistent					
Time	1	.23	.23	6.00*	.0705
Time x subjects	4	.15	.04		
Two-Attribute Inconsistent					
Time	1	5.63	5.63	3.91	.1191
Time x subjects	4	5.75	1.44		

*p < .10

Area cleaned known, price missing. The analysis of variance is summarized in Table A5-18. There was a significant service x time x context interaction. Simple time x context interactions for each service are summarized in Table A5-19. The interaction was significant for the very unattractive and extremely attractive service descriptions. The simple effects of time are summarized in Table A5-20 for the very unattractive service, and in Table A5-21 for the extremely attractive service. The simple effects of time were nonsignificant in every case. Again, despite significant higher order interactions, there are no significant pairwise differences in the way services were rated over time.

Versatility known, area cleaned missing. The analysis of variance is summarized in Table A5-22. There was a significant service x time x order interaction. Simple service x time interactions are summarized in Table A5-23. The interaction was significant for both orders. The simple effects of time are summarized in Table A5-24 for conditions in which the one-attribute context was presented first and Table A5-25 for conditions in which the two-attribute context was presented first. The simple effects of time were significant for four of these comparisons: for the extremely unattractive service when the one-attribute context was presented first, and for the extremely unattractive, very unattractive, and very attractive descriptions when the two-attribute context was presented first. Means before and after the product rating task were -4.77 and -4.27, -4.54 and -3.65, -3.84 and -3.19, and 3.84 and 2.96 for these four comparisons, respectively. In every case, evaluations became less polarized following the product rating task. Because exposure to the products made the services appear less extreme, it may be that the services were not evaluatively extreme enough to successfully anchor the response scale in these contexts.

Weight known, area cleaned missing. The analysis of variance is summarized in Table A5-27. There was a significant service x time x context x order interaction. Simple service x time x context interactions are summarized in Table A5-28. The interaction was significant only when the two-attribute context was presented first. The simple context x time interactions when the two-attribute context was presented first are summarized in Table A5-29. The interaction was nonsignificant for every service, indicating no differences between contexts in the way services were rated over time.

Price known, area cleaned missing. The analysis of variance is summarized in Table A5-30. There was a significant time x context x order interaction. Simple time x context interactions are summarized in Table A5-31. The interaction was significant only when the one-attribute context was presented first. Simple effects of time for the condition in which the one-attribute context was presented first are summarized in Table A5-32. In the two-attribute consistent context, ratings became significantly lower following the product ratings task. These means were .15 and 0.00. On the average, then, ratings of services in this context did change over time, but only when the one-attribute context was presented first.

Summary

These results provide fairly strong evidence that the response scale remained stable over time in the refrigerator product class. Despite the frequent presence of higher order interactions which suggest that the response scale was not stable over time in the carpet cleaner product class, there were relatively few cases in which pairwise comparisons indicated that ratings of services changed significantly over time. While the response scale was not entirely stable over time, there is little evidence of systematic changes such as would be expected if range effects were responsible for differences in ratings between contexts. It may therefore be concluded that the services rating task was quite effective in controlling for range effects in the refrigerator product class, and at least moderately effective in controlling for range effects in the carpet cleaner product class.

Effects of Correlations between Attributes

Two product sets were constructed for each two-attribute information context: one in which attribute correlations were consistent with expectations, and one in which attribute correlations were inconsistent with expectations. An analysis of variance with context (two-attribute consistent and two-attribute inconsistent) and order of presentation (one-attribute context first or two-attribute context first) as between subjects factors and attractiveness of the known attribute (very unattractive, moderately unattractive, moderately attractive, and very attractive) as a within subject factor was conducted for every known and missing attribute combination. These analyses are summarized in Tables A5-33 through A5-51.

It was expected that if correlations between attributes affected processing strategy, there would be a significant main effect of context or a context x attractiveness of the known attribute interaction. Any interactions of these effects with order were also examined. Because it was desirable to establish that correlations between attributes did not affect processing strategy, an alpha level of .10 was adopted for these analyses. For most known and missing attribute combinations, none of the effects of interest were significant. It was concluded that correlations between attributes generally had little effect on processing strategy. Combinations for which at least one of the effects of interest was significant are discussed below.

Table A5-33
Analysis of Variance
Refrigerator Evaluations in Consistent and Inconsistent Contexts
(Capacity Known, Warranty Missing)

Source	*df*	*SS*	*MS*	*F*	*p*
Between					
Context	1	.11	.11	.01	.9257
Order	1	5.51	5.51	.44	.5166
Context x order	1	27.61	27.61	2.20	.1571
Subjects(context x order)	16	200.50	12.53		
Within					
Attractiveness	3	73.64	24.55	5.14*	.0036
Attractiveness x context	3	1.14	.38	.08	.9709
Attractiveness x order	3	15.74	5.25	1.10	.3587
Att. x context x order	3	3.64	1.21	.25	.8581
Att. x subjects(context x order)	48	229.10	4.77		
	79	556.99			

*p < .10

Table A5-34
Analysis of Variance
Refrigerator Evaluations in Consistent and Inconsistent Contexts
(Capacity Known, Shelf Space Missing)

Source	df	SS	MS	F	p
Between					
Context	1	1.51	1.51	.20	.6573
Order	1	35.11	35.11	4.74*	.0447
Context x order	1	.11	.11	.02	.9034
Subjects(context x order)	16	118.40	7.40		
Within					
Attractiveness	3	192.74	64.25	19.23*	.0001
Attractiveness x context	3	14.64	4.88	1.46	.2372
Attractiveness x order	3	2.44	.81	.24	.8658
Att. x context x order	3	3.04	1.01	.30	.8231
Att. x subjects(context x order)	48	160.40	3.34		
	79	528.39			

*$p < .10$

Table A5-35
Analysis of Variance
Refrigerator Evaluations in Consistent and Inconsistent Contexts
(Capacity Known, Energy Cost Missing)

Source	df	SS	MS	F	p
Between					
Context	1	3.61	3.61	.37	.5520
Order	1	2.11	2.11	.22	.6485
Context x order	1	.11	.11	.01	.9160
Subjects(context x order)	16	156.60	9.79		
Within					
Attractiveness	3	81.14	27.05	7.33*	.0004
Attractiveness x context	3	10.34	3.45	.93	.4314
Attractiveness x order	3	4.24	1.41	.38	.7657
Att. x context x order	3	12.04	4.01	1.09	.3632
Att. x subjects(context x order)	48	177.00	3.69		
	79	447.19			

$^{*}p < .10$

Table A5-36
Analysis of Variance
Refrigerator Evaluations in Consistent and Inconsistent Contexts
(Capacity Known, Price Missing)

Source	*df*	*SS*	*MS*	*F*	*p*
Between					
Context	1	0.00	0.00	0.00	1.0000
Order	1	26.45	26.45	1.87	.1906
Context x order	1	20.00	20.00	1.41	.2520
Subjects(context x order)	16	226.60	14.16		
Within					
Attractiveness	3	181.35	60.45	16.81*	.0001
Attractiveness x context	3	17.80	5.93	1.65	.1903
Attractiveness x order	3	4.95	1.65	.46	.7123
Att. x context x order	3	5.80	1.93	.54	.6588
Att. x subjects(context x order)	48	172.60	3.60		
	79	655.55			

*$p < .10$

Table A5-37
Analysis of Variance
Refrigerator Evaluations in Consistent and Inconsistent Contexts
(Warranty Known, Capacity Missing)

Source	*df*	*SS*	*MS*	*F*	*p*
Between					
Context	1	3.61	3.61	.45	.5120
Order	1	.01	.01	0.00	.9690
Context x order	1	1.01	1.01	.13	.7270
Subjects(context x order)	16	128.50	8.03		
Within					
Attractiveness	3	250.64	83.55	26.68*	.0001
Attractiveness x context	3	14.54	4.85	1.55	.2143
Attractiveness x order	3	.74	.25	.08	.9713
Att. x context x order	3	2.54	.85	.27	.8466
Att. x subjects(context x order)	48	150.30	3.13		
	79	551.88			

*p < .10

Table A5-38
Analysis of Variance
Refrigerator Evaluations in Consistent and Inconsistent Contexts
(Shelf Space Known, Capacity Missing)

Source	*df*	*SS*	*MS*	*F*	*p*
Between					
Context	1	1.01	1.01	.45	.5113
Order	1	2.11	2.11	.94	.3463
Context x order	1	23.11	23.11	10.30*	.0055
Subjects(context x order)	16	35.90	2.24		
Within					
Attractiveness	3	392.44	130.81	76.11*	.0001
Attractiveness x context	3	2.74	.91	.53	.6632
Attractiveness x order	3	1.44	.50	.28	.8404
Att. x context x order	3	2.64	.88	.51	.6763
Att. x subjects(context x order)	48	82.50	1.72		
	79	543.89			

$*p < .10$

Table A5-39
Simple Effects of Context
Refrigerator Evaluations in Consistent and Inconsistent Contexts
(Shelf Space Known, Capacity Missing)

Source	*df*	*SS*	*MS*	*F*	*p*
One-Attribute Context First					
Context	1	16.90	16.90	11.76*	.0090
Subjects(context)	8	11.50	1.44		
Two-Attribute Context First					
Context	1	7.23	7.23	2.37	.1623
Subjects(context)	8	24.40	3.05		

*$p < .10$

Table A5-40
Analysis of Variance
Refrigerator Evaluations in Consistent and Inconsistent Contexts
(Energy Cost Known, Capacity Missing)

Source	_df_	_SS_	_MS_	_F_	_p_
Between					
Context	1	12.80	12.80	1.15	.3001
Order	1	1.25	1.25	.11	.7422
Context x order	1	1.80	1.80	.16	.6933
Subjects(context x order)	16	178.60	11.16		
Within					
Attractiveness	3	242.05	80.68	30.79*	.0001
Attractiveness x context	3	26.50	8.83	3.37*	.0259
Attractiveness x order	3	15.45	5.15	1.97	.1318
Att. x context x order	3	7.70	2.57	.98	.4104
Att. x subjects(context x order)	48	125.80	2.62		
	79	611.95			

*$p < .10$

Table A5-41
Analysis of Variance
Refrigerator Evaluations in Consistent and Inconsistent Contexts
(Price Known, Capacity Missing)

Source	*df*	*SS*	*MS*	*F*	*p*
Between					
Context	1	1.01	1.01	.18	.6753
Order	1	.11	.11	.02	.8887
Context x order	1	1.51	1.51	.27	.6092
Subjects(context x order)	16	89.00	5.56		
Within					
Attractiveness	3	47.44	15.81	6.40*	.0010
Attractiveness x context	3	2.44	.81	.33	.8045
Attractiveness x order	3	3.74	1.25	.50	.6812
Att. x context x order	3	5.54	1.85	.75	.5294
Att. x subjects(context x order)	48	118.60	2.47		
	79	269.39			

*p < .10

Table A5-42
Analysis of Variance
Carpet Cleaner Evaluations in Consistent and Inconsistent Contexts
(Area Cleaned Known, Versatility Missing)

Source	_df_	_SS_	_MS_	_F_	_p_
Between					
Context	1	.11	.11	.01	.9219
Order	1	3.61	3.61	.32	.5803
Context x order	1	.31	.31	.03	.8702
Subjects(context x order)	16	181.40	11.34		
Within					
Attractiveness	3	199.04	66.35	31.41*	.0001
Attractiveness x context	3	13.94	4.65	2.20	.1003
Attractiveness x order	3	10.24	3.41	1.62	.1981
Att. x context x order	3	8.14	2.71	1.28	.2905
Att. x subjects(context x order)	48	101.40	2.11		
	79	518.19			

*p < .10

Table A5-43
Analysis of Variance
Carpet Cleaner Evaluations in Consistent and Inconsistent Contexts
(Area Cleaned Known, Tank Capacity Missing)

Source	_df_	_SS_	_MS_	_F_	_p_
Between					
Context	1	4.05	4.05	.84	.3741
Order	1	.20	.20	.04	.8415
Context x order	1	.45	.45	.09	.7644
Subjects(context x order)	16	77.50	4.84		
Within					
Attractiveness	3	306.90	102.30	23.20*	.0001
Attractiveness x context	3	3.05	1.02	.23	.8747
Attractiveness x order	3	4.90	1.63	.37	.7747
Att. x context x order	3	13.45	4.48	1.02	.3936
Att. x subjects(context x order)	48	211.70	4.41		
	79	622.20			

*$p < .10$

Table A5-44
Analysis of Variance
Carpet Cleaner Evaluations in Consistent and Inconsistent Contexts
(Area Cleaned Known, Weight Missing)

Source	_df_	_SS_	_MS_	_F_	_p_
Between					
Context	1	3.61	3.61	.32	.5793
Order	1	2.81	2.81	.25	.6244
Context x order	1	5.51	5.51	.49	.4946
Subjects(context x order)	16	180.50	11.28		
Within					
Attractiveness	3	297.74	99.25	36.79*	.0001
Attractiveness x context	3	7.74	2.58	.96	.4212
Attractiveness x order	3	7.94	2.65	.98	.4097
Att. x context x order	3	2.84	.95	.35	.7889
Att. x subjects(context x order)	48	129.50	2.70		
	79	638.19			

*_p_ < .10

Table A5-45
Analysis of Variance
Carpet Cleaner Evaluations in Consistent and Inconsistent Contexts
(Area Cleaned Known, Price Missing)

Source	*df*	*SS*	*MS*	*F*	*p*
Between					
Context	1	6.05	6.05	.47	.5012
Order	1	4.05	4.05	.32	.5812
Context x order	1	14.45	14.45	1.13	.3033
Subjects(context x order)	16	204.40	12.78		
Within					
Attractiveness	3	230.05	76.68	21.15*	.0001
Attractiveness x context	3	18.45	6.15	1.70	.1803
Attractiveness x order	3	8.25	2.75	.76	.5229
Att. x context x order	3	.25	.08	.02	.9952
Att. x subjects(context x order)	48	174.00	3.63		
	79	659.95			

*p < .10

Table A5-46
Analysis of Variance
Carpet Cleaner Evaluations in Consistent and Inconsistent Contexts
(Versatility Known, Area Cleaned Missing)

Source	df	SS	MS	F	p
Between					
Context	1	1.25	1.25	.40	.5372
Order	1	.20	.20	.06	.8041
Context x order	1	14.45	14.45	4.60*	.0477
Subjects(context x order)	16	50.30	3.14		
Within					
Attractiveness	3	430.00	143.33	54.39*	.0001
Attractiveness x context	3	2.55	.85	.32	.8090
Attractiveness x order	3	2.20	.73	.28	.8408
Att. x context x order	3	19.75	6.58	2.50*	.0708
Att. x subjects(context x order)	48	126.50	2.64		
	79	647.20			

*$p < .10$

Table A5-47
Simple Context x Attractiveness of the Known Attribute Interactions
Carpet Cleaner Evaluations in Consistent and Inconsistent Contexts
(Versatility Known, Area Cleaned Missing)

Source	*df*	*SS*	*MS*	*F*	*p*
One-Attribute Context First					
Attractiveness x context	3	4.90	1.63	1.13	.3569
Att. x subjects(context)	24	34.70	1.45		
Two-Attribute Context First					
Attractiveness x context	3	17.40	5.80	1.52	.2357
Att. x subjects(context)	24	91.80	3.83		

Table A5-48
Analysis of Variance
Carpet Cleaner Evaluations in Consistent and Inconsistent Contexts
(Tank Capacity Known, Area Cleaned Missing)

Source	_df_	_SS_	_MS_	_F_	_p_
Between					
Context	1	18.05	18.05	3.41*	.0834
Order	1	39.20	39.20	7.40*	.0151
Context x order	1	0.00	0.00	0.00	1.0000
Subjects(context x order)	16	84.70	5.29		
Within					
Attractiveness	3	90.55	30.18	9.28*	.0001
Attractiveness x context	3	11.35	3.78	1.16	.3335
Attractiveness x order	3	1.20	.40	.12	.9461
Att. x context x order	3	22.80	7.60	2.34*	.0854
Att. x subjects(context x order)	48	156.10	3.25		
	79	423.95			

*_p_ < .10

Table A5-49
Simple Context x Attractiveness of the Known Attribute Interactions
Carpet Cleaner Evaluations in Consistent and Inconsistent Contexts
(Tank Capacity Known, Area Cleaned Missing)

Source	*df*	*SS*	*MS*	*F*	*p*
One-Attribute Context First					
Attractiveness x context	3	28.08	9.36	4.00*	.0193
Att. x subjects(context)	24	56.20	2.34		
Two-Attribute Context First					
Attractiveness x context	3	6.08	2.03	.49	.6949
Att. x subjects(context)	24	99.90	4.16		

$^*p < .10$

Table A5-50
Analysis of Variance
Carpet Cleaner Evaluations in Consistent and Inconsistent Contexts
(Weight Known, Area Cleaned Missing)

Source	*df*	*SS*	*MS*	*F*	*p*
Between					
Context	1	.01	.01	0.00	.9767
Order	1	23.11	23.11	1.62	.2210
Context x order	1	4.51	4.51	.32	.5814
Subjects(context x order)	16	228.00	14.25		
Within					
Attractiveness	3	125.94	41.98	13.29*	.0001
Attractiveness x context	3	13.64	4.55	1.44	.2430
Attractiveness x order	3	3.14	1.05	.33	.8028
Att. x context x order	3	4.94	1.65	.52	.6698
Att. x subjects(context x order)	48	151.60	3.16		
	79	554.89			

**p* < .10

Table A5-51
Analysis of Variance
Carpet Cleaner Evaluations in Consistent and Inconsistent Contexts
(Price Known, Area Cleaned Missing)

Source	*df*	*SS*	*MS*	*F*	*p*
Between					
Context	1	31.25	31.25	3.29*	.0885
Order	1	1.80	1.80	.19	.6692
Context x order	1	1.25	1.25	.13	.7215
Subjects(context x order)	16	152.00	9.50		
Within					
Attractiveness	3	145.50	48.50	12.90*	.0001
Attractiveness x context	3	12.85	4.28	1.14	.3426
Attractiveness x order	3	6.30	2.10	.56	.6448
Att. x context x order	3	3.45	1.15	.31	.8209
Att. x subjects(context x order)	48	180.40	3.76		
	79	534.80			

$^{*}p < .10$

Refrigerator Product Class

Shelf space known, capacity missing. The analysis of variance is summarized in Table A5-38. Although neither the context main effect nor the attractiveness x context interaction were significant, there was a significant context x order interaction. Simple effects of context are summarized in Table A5-39. When the one-attribute context was presented first, evaluations in the consistent context were significantly more negative than in the inconsistent context. These means were -.95 for the consistent context and .35 for the inconsistent context. When the two-attribute context was presented first, the simple effects of context were nonsignificant.

Energy cost known, capacity missing. The analysis of variance is summarized in Table A5-40. Although the context main effect was not significant, there was a significant attractiveness x context interaction. Because the primary interest here is in trends rather than in pairwise comparisons of means, the simple effects of consistency were not examined.

Carpet Cleaner Product Class

Versatility known, area cleaned missing. The analysis of variance is summarized in Table A5-46. Although neither the context main effect nor the attractiveness x context interaction were significant, there was a significant attractiveness x context x order interaction. The simple attractiveness x context interactions are summarized in Table A5-47. None of these simple interactions were significant.

Tank capacity known, area cleaned missing. The analysis of variance is summarized in Table A5-48. The context main effect was significant. Evaluations in the consistent context were significantly less favorable than evaluations in the inconsistent context. These means were -1.45 and -.50 for the consistent and inconsistent contexts, respectively. Although the attractiveness x context interaction was not significant, there was a significant attractiveness x context x order interaction. The simple attractiveness x context interactions are summarized in Table A5-49. The interaction was significant only when the one-attribute context was presented first.

Summary

It may be concluded that evaluations were generally not influenced by whether observed correlations between attributes were consistent with expectations. The context main effect was significant for only one of the 16 comparisons, while there was a significant simple effect of context for two comparisons. The attractiveness x context interaction was significant for only one of the 16 comparisons, and there was a significant simple attractiveness x context interaction for one other comparison. This number of significant effects would be expected by chance, given the number of comparisons and the .10 alpha level.

Summary Tables for Planned Comparisons

Table A5-52
Planned Comparisons
Refrigerator Evaluations Based on Capacity
(Two-Attribute Context: Capacity and Warranty)

Source	_df_	_SS_	_MS_	_F_	_p_
Context	1	234.57	234.57	26.60*	.0001
Subjects(context x order)	48	423.27	8.82		
Linear x context	1	24.09	24.09	1.91	.1737
Linear x subjects(context x order)	48	606.43	12.63		
Quadratic x context	1	.57	.57	.14	.7142
Quadratic x subjects(context x order)	48	201.85	4.21		

*p < .05

Table A5-53
Planned Comparisons
Refrigerator Evaluations Based on Capacity
(Two-Attribute Context: Capacity and Shelf Space)

Source	_df_	_SS_	_MS_	_F_	_p_
Context	1	108.25	108.25	16.49*	.0002
Subjects(context x order)	48	315.07	6.56		
Linear x context	1	.95	.95	.08	.7846
Linear x subjects(context x order)	48	602.15	12.55		
Quadratic x context	1	6.11	6.11	1.83	.1821
Quadratic x subjects(context x order)	48	159.89	3.33		

*p < .05

Table A5-54
Planned Comparisons
Refrigerator Evaluations Based on Refrigerator Capacity
(Two-Attribute Context: Capacity and Energy Cost)

Source	*df*	*SS*	*MS*	*F*	*p*
Context	1	38.37	38.37	5.18*	.0273
Subjects(context x order)	48	355.37	7.40		
Linear x context	1	19.98	19.98	1.63	.2075
Linear x subjects(context x order)	48	587.55	12.24		
Quadratic x context	1	.60	.60	.17	.6828
Quadratic x subjects(context x order)	48	171.66	3.58		

*p < .05

Table A5-55
Planned Comparisons
Refrigerator Evaluations Based on Refrigerator Capacity
(Two-Attribute Context: Capacity and Price)

Source	*df*	*SS*	*MS*	*F*	*p*
Context	1	2.96	2.96	.32	.5731
Subjects(context x order)	48	441.65	9.20		
Linear x context	1	1.15	1.15	.09	.7605
Linear x subjects(context x order)	48	588.43	12.26		
Quadratic x context	1	1.81	1.81	.48	.4898
Quadratic x subjects(context x order)	48	179.44	3.74		

Table A5-56
Planned Comparisons
Refrigerator Evaluations Based on Refrigerator Warranty
(Two-Attribute Context: Capacity and Warranty)

Source	*df*	*SS*	*MS*	*F*	*p*
Context	1	75.77	75.77	10.26*	.0024
Subjects(context x order)	48	354.56	7.39		
Linear x context	1	46.68	46.68	7.43*	.0089
Linear x subjects(context x order)	48	301.55	6.28		
Quadratic x context	1	5.26	5.26	5.96*	.0184
Quadratic x subjects(context x order)	48	42.37	.88		

*$p < .05$

Table A5-57
Planned Comparisons
Refrigerator Evaluations Based on Refrigerator Shelf Space
(Two-Attribute Context: Capacity and Shelf Space)

Source	*df*	*SS*	*MS*	*F*	*p*
Context	1	11.63	11.63	3.07*	.0860
Subjects(context x order)	48	181.63	3.78		
Linear x context	1	23.60	23.60	5.90*	.0189
Linear x subjects(context x order)	48	191.93	4.00		
Quadratic x context	1	.04	.04	.04	.8468
Quadratic x subjects(context x order)	48	51.06	1.06		

*$p < .05$

Table A5-58
Planned Comparisons
Refrigerator Evaluations Based on Refrigerator Energy Cost
(Two-Attribute Context: Capacity and Energy Cost)

Source	*df*	*SS*	*MS*	*F*	*p*
Context	1	34.92	34.92	4.06*	.0495
Subjects(context x order)	48	412.81	8.60		
Linear x context	1	3.10	3.10	.21	.6490
Linear x subjects(context x order)	48	710.22	14.80		
Quadratic x context	1	.17	.17	.15	.6960
Quadratic x subjects(context x order)	48	52.94	1.10		

$^*p < .05$

Table A5-59
Planned Comparisons
Refrigerator Evaluations Based on Refrigerator Price
(Two-Attribute Context: Capacity and Price)

Source	*df*	*SS*	*MS*	*F*	*p*
Context	1	28.98	28.98	7.62*	.0082
Subjects(context x order)	48	182.57	3.80		
Linear x context	1	67.91	67.91	5.53*	.0229
Linear x subjects(context x order)	48	589.93	12.29		
Quadratic x context	1	.09	.09	.02	.8855
Quadratic x subjects(context x order)	48	204.98	4.27		

$^*p < .05$

Table A5-60
Planned Comparisons
Carpet Cleaner Evaluations Based on Area Cleaned
(Two-Attribute Context: Area Cleaned and Versatility)

Source	*df*	*SS*	*MS*	*F*	*p*
Context	1	42.55	42.55	7.54*	.0085
Subjects(context x order)	48	270.75	5.64		
Linear x context	1	106.29	106.29	32.57*	.0001
Linear x subjects(context x order)	48	156.63	3.26		
Quadratic x context	1	.39	.39	.27	.6084
Quadratic x subjects(context x order)	48	70.06	1.46		

$^*p < .05$

Table A5-61
Planned Comparisons
Carpet Cleaner Evaluations Based on Carpet Cleaner Area Cleaned
(Two-Attribute Context: Area Cleaned and Tank Capacity)

Source	*df*	*SS*	*MS*	*F*	*p*
Context	1	10.75	10.75	3.02	.0888
Subjects(context x order)	48	170.92	3.56		
Linear x context	1	61.22	61.22	11.45*	.0014
Linear x subjects(context x order)	48	256.75	5.35		
Quadratic x context	1	6.40	6.40	5.80*	.0199
Quadratic x subjects(context x order)	48	52.92	1.10		

$^*p < .05$

Table A5-62
Planned Comparisons
Carpet Cleaner Evaluations Based on Carpet Cleaner Area Cleaned
(Two-Attribute Context: Area Cleaned and Weight)

Source	*df*	*SS*	*MS*	*F*	*p*
Context	1	.24	.24	.04	.8386
Subjects(context x order)	48	278.55	5.80		
Linear x context	1	60.34	60.34	16.09*	.0002
Linear x subjects(context x order)	48	180.02	3.75		
Quadratic x context	1	.83	.83	.65	.4225
Quadratic x subjects(context x order)	48	60.61	1.26		

$^*p < .05$

Table A5-63
Planned Comparisons
Carpet Cleaner Evaluations Based on Carpet Cleaner Area Cleaned
(Two-Attribute Context: Area Cleaned and Price)

Source	*df*	*SS*	*MS*	*F*	*p*
Context	1	20.30	20.30	3.11	.0844
Subjects(context x order)	48	313.82	6.54		
Linear x context	1	89.54	89.54	22.00*	.0001
Linear x subjects(context x order)	48	195.36	4.07		
Quadratic x context	1	2.09	2.09	1.33	.2545
Quadratic x subjects(context x order)	48	75.29	1.57		

$^*p < .05$

Table A5-64
Planned Comparisons
Carpet Cleaner Evaluations Based on Carpet Cleaner Versatility
(Two-Attribute Context: Area Cleaned and Versatility)

Source	*df*	*SS*	*MS*	*F*	*p*
Context	1	5.61	5.61	1.61	.2103
Subjects(context x order)	48	166.97	3.48		
Linear x context	1	15.07	15.07	3.19	.0806
Linear x subjects(context x order)	48	227.03	4.73		
Quadratic x context	1	.17	.17	.16	.6894
Quadratic x subjects(context x order)	48	50.76	1.06		

Table A5-65
Planned Comparisons
Carpet Cleaner Evaluations Based on Carpet Cleaner Tank Capacity
(Two-Attribute Context: Area Cleaned and Tank Capacity)

Source	*df*	*SS*	*MS*	*F*	*p*
Context	1	29.93	29.93	7.82*	.0074
Subjects(context x order)	48	183.61	3.83		
Linear x context	1	87.10	87.10	12.96*	.0008
Linear x subjects(context x order)	48	322.48	6.72		
Quadratic x context	1	.96	.96	.36	.5525
Quadratic x subjects(context x order)	48	128.53	2.68		

*$p < .05$

Table A5-66
Planned Comparisons
Carpet Cleaner Evaluations Based on Carpet Cleaner Weight
(Two-Attribute Context: Area Cleaned and Weight)

Source	df	SS	MS	F	p
Context	1	28.98	28.98	4.45*	.0401
Subjects(context x order)	48	312.38	6.51		
Linear x context	1	54.81	54.81	6.22*	.0162
Linear x subjects(context x order)	48	423.25	8.82		
Quadratic x context	1	2.06	2.06	.95	.3351
Quadratic x subjects(context x order)	48	104.17	2.17		

*$p < .05$

Table A5-67
Planned Comparisons
Carpet Cleaner Evaluations Based on Carpet Cleaner Price
(Two-Attribute Context: Area Cleaned and Price)

Source	df	SS	MS	F	p
Context	1	130.75	130.75	21.73*	.0001
Subjects(context x order)	48	288.80	6.02		
Linear x context	1	45.95	45.95	3.48	.0681
Linear x subjects(context x order)	48	633.02	13.19		
Quadratic x context	1	.42	.42	.14	.7065
Quadratic x subjects(context x order)	48	138.71	2.89		

*$p < .05$

Order Effects in Product Evaluations

In Experiment II, hypotheses were tested via a set of planned comparisons which examined the main effect of context and the linear and quadratic trend components of the context x attractiveness of the known attribute interaction. If these effects were involved in a significant interaction with the order in which the one-attribute and two-attribute contexts were presented, then the interpretation of the planned comparisons might be altered. To examine this possibility, an analysis of variance with information context (one-attribute and two-attribute) and order of presentation of the one-attribute context (first and second) as between subjects factors and attractiveness of the known attribute (very unattractive, moderately unattractive, moderately attractive, and very attractive) as a within subjects factor for each known attribute (five attributes) in each product class. These analyses are summarized in Tables A5-68 through A5-79.

From the standpoint of controlling error rate, it would have been desirable to conduct only one analysis for each product class, including known attribute (five levels) as a factor. This procedure was not followed because it would have resuted in a design with several missing cells. Although information context had only two levels for most known attributes (one-attribute and two-attribute), it had five levels for some known attributes (one-attribute context and four different two-attribute contexts). To simplify the design, a separate analysis was conducted for each known attribute.

Table A5-68
Analysis of Variance
Refrigerator Evaluations Based on Capacity

Source	*df*	*SS*	*MS*	*F*	*p*
Between					
Context	4	295.95	73.99	7.94*	.0001
Order	1	3.22	3.22	.35	.5577
Context x order	4	66.03	16.51	1.77	.1402
Subjects(context x order)	102	950.22	9.32		
Within					
Attractiveness	3	813.02	271.01	57.40*	.0001
Attractiveness x context	12	58.62	4.88	1.03	.4167
Attractiveness x order	3	7.01	2.34	.49	.6902
Att. x context x order	12	26.56	2.21	.47	.9320
Att. x s(context x order)	306	1444.79	4.72		
	447	3665.43			

*$p < .05$

Table A5-69
Analysis of Variance
Refrigerator Evaluations Based on Warranty

Source	df	SS	MS	F	p
Between					
Context	1	75.77	75.77	10.26*	.0024
Order	1	16.74	16.74	2.27	.1388
Context x order	1	9.56	9.56	1.29	.2610
Subjects(context x order)	48	354.56	7.39		
Within					
Attractiveness	3	1126.05	375.36	135.19*	.0001
Attractiveness x context	3	54.87	18.29	6.59*	.0004
Attractiveness x order	3	7.13	2.38	.86	.4680
Att. x context x order	3	6.39	2.13	.77	.5174
Att. x s(context x order)	144	399.81	2.78		
	207	2050.88			

*$p < .05$

Table A5-70
Analysis of Variance
Refrigerator Evaluations Based on Shelf Space

Source	df	SS	MS	F	p
Between					
Context	1	11.63	11.63	3.07	.0860
Order	1	.48	.48	.13	.7231
Context x order	1	1.70	1.70	.45	.5056
Subjects(context x order)	48	181.63	3.78		
Within					
Attractiveness	3	1446.94	482.31	232.61*	.0001
Attractiveness x context	3	24.46	8.15	3.93*	.0099
Attractiveness x order	3	2.94	.98	.47	.7055
Att. x context x order	3	.08	.03	.01	.9944
Att. x s(context x order)	144	298.58	2.07		
	207	1968.44			

$^*p < .05$

Table A5-71
Analysis of Variance
Refrigerator Evaluations Based on Energy Cost

Source	*df*	*SS*	*MS*	*F*	*p*
Between					
Context	1	34.92	34.92	4.06*	.0495
Order	1	.04	.04	.01	.9437
Context x order	1	1.59	1.59	.18	.6692
Subjects(context x order)	48	412.81	8.60		
Within					
Attractiveness	3	745.05	248.35	41.96*	.0001
Attractiveness x context	3	3.52	1.17	.20	.8959
Attractiveness x order	3	4.67	1.56	.26	.8526
Att. x context x order	3	12.18	4.06	.69	.5657
Att. x s(context x order)	144	852.33	5.92		
	207	2067.11			

*$p < .05$

Table A5-72
Analysis of Variance
Refrigerator Evaluations Based on Price

Source	*df*	*SS*	*MS*	*F*	*p*
Between					
Context	1	28.98	28.98	7.62*	.0082
Order	1	4.92	4.92	1.29	.2609
Context x order	1	4.76	4.76	1.25	.2689
Subjects(context x order)	48	182.57	3.80		
Within					
Attractiveness	3	461.88	153.96	24.96*	.0001
Attractiveness x context	3	68.14	22.71	3.68*	.0136
Attractiveness x order	3	12.35	4.12	.67	.5773
Att. x context x order	3	27.41	9.14	1.48	.2207
Att. x s(context x order)	144	888.22	6.17		
	207	1679.23			

$^*p < .05$

Table A5-73
Analysis of Variance
Carpet Cleaner Evaluations Based on Area Cleaned

Source	*df*	*SS*	*MS*	*F*	*p*
Between					
Context	4	64.62	16.16	2.15	.0803
Order	1	1.63	1.63	.22	.6428
Context x order	4	9.12	2.28	.30	.8753
Subjects(context x order)	102	767.27	7.52		
Within					
Attractiveness	3	2038.26	679.42	247.14*	.0001
Attractiveness x context	12	169.12	14.09	5.13*	.0001
Attractiveness x order	3	3.06	1.02	.37	.7769
Att. x context x order	12	32.10	2.68	.97	.4745
Att. x s(context x order)	306	841.22	2.75		
	447	3926.39			

*$p < .05$

Table A5-74
Analysis of Variance
Carpet Cleaner Evaluations Based on Versatility

Source	df	SS	MS	F	p
Between					
Context	1	5.61	5.61	1.61	.2103
Order	1	.94	.94	.27	.6051
Context x order	1	1.79	1.79	.51	.4768
Subjects(context x order)	48	166.97	3.48		
Within					
Attractiveness	3	1467.73	489.24	190.69*	.0001
Attractiveness x context	3	15.71	5.24	2.04	.1092
Attractiveness x order	3	5.48	1.83	.71	.5498
Att. x context x order	3	2.63	.88	.34	.7980
Att. x s(context x order)	144	369.46	2.57		
	207	2036.31			

*p < .05

Table A5-75
Analysis of Variance
Carpet Cleaner Evaluations Based on Tank Capacity

Source	*df*	*SS*	*MS*	*F*	*p*
Between					
Context	1	29.93	29.93	7.82*	.0074
Order	1	15.62	15.62	4.08*	.0489
Context x order	1	23.59	23.59	6.17*	.0166
Subjects(context x order)	48	183.61	3.83		
Within					
Attractiveness	3	729.63	243.21	65.70*	.0001
Attractiveness x context	3	88.19	29.40	7.94*	.0001
Attractiveness x order	3	8.09	2.70	.73	.5399
Att. x context x order	3	6.26	2.09	.56	.6441
Att. x s(context x order)	144	533.08	3.70		
	207	1618.00			

*$p < .05$

Table A5-76
Simple Effects of Context
Carpet Cleaner Evaluations Based on Tank Capacity

Source	*df*	*SS*	*MS*	*F*	*p*
One-Attribute Context First					
Context	1	.19	.19	.06	.8152
Subjects(context)	24	80.98	3.37		
Two-Attribute Context First					
Context	1	53.33	53.33	12.47*	.0017
Subjects(context)	24	102.63	4.28		

*$p < .05$

Table A5-77
Analysis of Variance
Carpet Cleaner Evaluations Based on Weight

Source	*df*	*SS*	*MS*	*F*	*p*
Between					
Context	1	28.98	28.98	4.45*	.0401
Order	1	9.31	9.31	1.43	.2376
Context x order	1	13.81	13.81	2.12	.1517
Subjects(context x order)	48	312.38	6.51		
Within					
Attractiveness	3	686.40	228.80	50.76*	.0001
Attractiveness x context	3	66.31	22.10	4.90*	.0030
Attractiveness x order	3	52.96	17.65	3.92*	.0101
Att. x context x order	3	44.70	14.90	3.31*	.0219
Att. x s(context x order)	144	649.13	4.51		
	207	1863.98			

*$p < .05$

Table A5-78
Simple Context x Attractiveness of the Known Attribute Interactions
Carpet Cleaner Evaluations Based on Weight

Source	*df*	*SS*	*MS*	*F*	*p*
One-Attribute Context First					
Attractiveness x context	3	99.28	33.09	11.51*	.0001
Att. x subjects(context)	72	206.98	2.87		
Two-Attribute Context First					
Attractiveness x context	3	11.73	3.91	.64	.5978
Att. x subjects(context)	72	442.15	6.14		

*$p < .05$

Table A5-79
Analysis of Variance
Carpet Cleaner Evaluations Based on Price

Source	*df*	*SS*	*MS*	*F*	*p*
Between					
Context	1	130.75	130.75	21.73*	.0001
Order	1	0.00	0.00	0.00	.9776
Context x order	1	3.12	3.12	.52	.4753
Subjects(context x order)	48	288.80	6.02		
Within					
Attractiveness	3	783.05	261.02	40.25*	.0001
Attractiveness x context	3	46.41	15.47	2.39	.0704
Attractiveness x order	3	5.13	1.71	.26	.8520
Att. x context x order	3	4.82	1.61	.25	.8630
Att. x s(context x order)	144	933.84	6.49		
	207	2195.92			

*$p < .05$

The use of multiple analyses of variance creates concern about the overall error rate, and makes it desirable to set alpha at a conservative level. On the other hand, the need to establish that the effects of interest do not interact with order of presentation makes it desirable to set alpha at a less conservative level. These competing concerns were balanced by setting alpha at .05, yielding an experimentwise error rate of $1-(1-.05)^5 = .23$.

Only interactions of order with the main effect of context and the context x attractiveness of the known attribute interaction were examined. For most known attributes, these effects were not significant. It was concluded that interactions with order did not change the interpretation of the planned comparisons. Significant interactions are discussed below.

Carpet Cleaner Tank Capacity

The analysis is summarized in Table A5-75. Although there was a significant main effect of context, there was also significant context x order interaction. Simple effects of context are summarized in Table A5-76. The effect of context was significant only when the one-attribute context was presented second.

Carpet Cleaner Weight

The analysis is summarized in Table A5-77. Although planned comparisons indicated a significant difference in linear trend, there was a significant attractiveness x context x order interaction. Simple attractiveness x context interactions are summarized in Table A5-78. The attractiveness x context interaction was significant only when the one-attribute context was presented first.

Summary

These analyses provide little evidence that the planned comparisons are misleading in their characterization of the data. In two cases, it was found that a significant planned comparison was significant for only one of the presentation orders. Otherwise, no interactions involving order indicated that the interpretation of the planned comparisons should be altered.

APPENDIX VI
SUPPLEMENTARY TABLES AND ANALYSES FOR EXPERIMENT IV

Additional Attribute Descriptions for Experiment IV

Table A6-1
Additional Refrigerator Attribute Descriptions for Experiment IV

Attribute	Attractive-ness*	Description
Warranty	--	2.5 months warranty
	-	4.5 months warranty
	+	18.5 months warranty
	++	24.5 months warranty
Shelf space	--	1 full shelf, 1 door shelf
	-	2 full shelves, 2 door shelves
	+	3 full shelves, 3 door shelves
	++	4 full shelves, 4 door shelves
Energy cost	--	$19.50/month average energy cost
	-	$11.50/month average energy cost
	+	$5.50 /month average energy cost
	++	$1.50 /month average energy cost
Price	--	$1595 price
	-	$1195 price
	+	$495 price
	++	$345 price
Capacity	--	5 cu. ft. refrigerator capacity
	-	7 cu. ft. refrigerator capacity
	+	19 cu. ft. refrigerator capacity
	++	26 cu. ft. refrigerator capacity

* -- very unattractive
- moderately unattractive
+ moderately attractive
++ very attractive

Note: The descriptions for price and capacity were also employed in Experiment III.

Table A6-2
Additional Carpet Cleaner Attribute Descriptions for Experiment IV

Attribute	Attractive-ness*	Description
Versatility	--	suitable only for weather resistant patio and porch carpets
	-	suitable only for 100% synthetic carpets
	+	suitable for most syntetic and natural fiber carpets
	++	suitable for all types of carpets and rugs
Tank Capacity	--	tank holds .3 gal. cleaning solution
	-	tank holds .5 gal. cleaning solution
	+	tank holds 1.5 gal. cleaning solution
	++	tank holds 2.0 gal. cleaning solution
Weight	--	weighs 48 lbs. when tank is full
	-	weighs 33 lbs. when tank is full
	+	weighs 18 lbs. when tank is full
	++	weighs 10 lbs. when tank is full
Price	--	$498 price
	-	$298 price
	+	$123 price
	++	$78 price
Area Cleaned	--	cleans 30% average size room/refill
	-	cleans 80% average size room/refill
	+	cleans 2.30 average size rooms/refill
	++	cleans 3.05 average size rooms/refill

* -- very unattractive
- moderately unatttractive
+ moderately attractive
++ very attractive

Order and Position Effects in Response Latencies

In this series of studies, the attractiveness of the known attribute is a within subjects factor. In designs which include within subjects factors, observed treatment effects may be at least partially attributable to the order in which the treatment levels are presented. This may occur when there is a consistent change in responses over time (as when there is a practice effect) or when preceding treatment levels differentially affect susequent responses (differential transfer effects). To avoid this problem, order and treatment effects must not be confounded.

Confounding of order and treatment effects may be eliminated either by randomizing the presentation of within subject treatment levels separately for each subject, as was done in Experiment II, or by counterbalancing the order of presentation of the within subject treatment levels, as was done in the current study. The attractiveness of the known attribute, which was varied across four levels within subjects, was counterbalanced so that each attractiveness level appeared equally often in each ordinal position.

The counterbalancing procedure has the advantage of allowing an assessment of order and position effects. Not all such effects are of equal interest, however. In general, order and position effects are of interest when they may alter the interpretation of substantive effects. In the current study, hypotheses about response latencies concern only the main effect of context. Therefore, only order and position effects which may alter the interpretation of the context main effect are of serious concern. As will be seen below, it was concluded that there were no order or position effects which would alter the interpretation of the context main effect.

An analysis of variance with context (one-attribute context and two-attribute contexts) and order (four counterbalancing sequences) as between subjects factors and attractiveness of the known attribute (very unattractive, moderately unattractive, moderately attractive, and very attractive), and ordinal position (one, two, three, or four) as within subjects factors was conducted for each known attribute.

The order main effect indicates whether there is a difference, on the average, in response latencies for different counterbalancing sequences. If this effect is significant, it implies that there was some differential transfer across attractivenss levels. As the attractiveness main effect is not of substantive interest, a significant effect of order is not of serious concern.

The context x order interaction indicates whether the average effects of couterbalancing sequence are different in different information contexts. If this effect is significant, it implies that there was a difference in the type or amount of differential transfer which occurred in different information contexts. If this occurs, the main effect of context may be at least partially attributable to differences in differential transfer. Therefore, for there to be no concern about the interpretation of the context main effect, the context x order interaction must be nonsignificant.

The position main effect indicates whether, on the average, evaluations vary as a function of ordinal position. If the position main effect is significant, it implies that response latencies are affected not only by the attractiveness level, but also by ordinal position. As the main effect of attractiveness is of little substantive interest, however, a main effect of position is of little concern. In fact, a position effect seems likely to occur, as product descriptions within a information context are quite similar to one another. As the subject becomes more familiar with the general format of descriptions and the type of information that is provided, it is likely that evaluations will be made more rapidly.

The position x context interaction indicates whether the average effects of ordinal position are different in different information contexts. If this effect is significant, it implies that the main effect of context may be partially attributable to differences in position effects between contexts. Ideally, for the interpretation of the context main effect to be unambiguous, the position x context interaction should be nonsignificant.

In this study, however, a position x context interaction seems likely to occur. In the one-attribute context, test descriptions contain the same type and amount of information as all other descriptions. In the two-attribute context, however, test descriptions are different from other descriptions in that they provide less information than the subject is accustomed to receiving. While a general practice effect may occur in both contexts, it seems likely that the first test description encountered in the two-attribute context may take longer to evaluate because the subject is, in effect, surprised by the difference in the description. The remaining test descriptions will not have this surprise value and thus will take less time to evaluate.

Such a position x context interaction is of concern only if the main effect of context is entirely attributable to long response latencies to evaluate the first test description in the two-attribute context. If this were true, it would imply that missing information captures attention only because of its surprise value. While this effect would be of some interest in itself, its implications for the processing of product information are much less broad than if missing information captures attention independent of its surprise value.

Therefore, if the position x context interaction is significant, it is important to determine if the main effect of context is entirely attributable to the simple effect of context in the first ordinal position, or if the effect has more generality, that is, if it also occurs at the second, third, and fourth ordinal positions. If it does, then the position x context interaction does not alter the interpretation of the context main effect.

In summary, then, for the interpretation of the context main effect to be unambiguous, the context x order and the position x context interactions should be nonsignificant. If the position x context interaction is significant, however, there is little cause for concern as long as the simple effects of context are significant in the predicted direction at all ordinal positions. In this case, only the magnitude of the context main effect may be called into question. The difference in response latencies between the one- and two-attribute context may be slightly inflated if subjects take an unusually long time to evaluate the first test description in the two-attribute context.

The analyses are summarized in Tables A6-3 through A6-7 for each known and missing attribute combination. The context x order and position x context interactions were nonsignificant in every case. For evaluations based on information about refrigerator price, however, there was a marginally significant position x context interaction. The simple effects of context were examined at every position. These analyses are summarized in Table A6-5. Although differences in means were in the predicted direction at every position, the difference was significant only in the first position. The difference was marginally significant in positions three and four, however. It appears that the significant main effect of context for this comparison may be somewhat misleading; the difference in reponse latencies between the one- and two-attribute contexts is largely attributable to the simple effects of context in the first position.

With the exception of this one comparison, however, it was concluded that order and position effects did not create any ambiguity in the interpretation of the context main effect. In fact, the repeated measures design gives insight into the nature of the response to missing information. It does not appear that missing information captures attention solely by virture of its surprise value, but rather that noticing missing information is an attention-consuming process even when it is not unexpected.

Table A6-3
Analysis of Variance
Average Response Times Based on Refrigerator Capacity

Source	*df*	*SS*	*MS*	*F*	*p*
Between					
Context	4	857883.08	214470.77	8.47*	.0001
Order	3	26770.54	8923.51	.35	.7874
Context x order	12	479284.94	39940.41	1.58	.1149
Subjects(context x order)	80	2024693.38	25308.66		
Within					
Attractiveness	3	84789.80	28263.27	3.96*	.0088
Attractiveness x context	12	143393.31	11949.44	1.67	.0734
Position	3	487034.60	162344.87	22.73*	.0001
(Att. x order residual)	6	65389.83	10898.31	1.53	.1689
Position x context	12	86127.28	7177.27	1.00	.4449
(Att. x context x ord. resid.)	24	99373.38	4140.56	.58	.7461
Att. x s(context x order)	240	1713977.63	7141.57		
	399	6068717.74			

$*p < .05$

Table A6-4
Analysis of Variance
Average Response Times Based on Refrigerator Price

Source	*df*	*SS*	*MS*	*F*	*p*
Between					
Context	1	264997.70	264997.70	4.23*	.0478
Order	3	218812.67	72937.55	1.17	.3382
Context x order	3	152083.52	50694.50	.81	.4977
Subjects(context x order)	32	2002731.43	62585.34		
Within					
Attractiveness	3	35447.22	11825.74	1.92	.1320
Attractiveness x context	3	6008.92	2003.97	.32	.8074
Position	3	94174.69	31391.56	5.09*	.0026
(Att. x order residual)	6	175842.12	29307.02	4.75*	.0002
Position x context	3	49067.72	16355.91	2.65	.0530
(Att. x context x ord. resid.)	6	42681.37	7113.56	1.15	.3375
Att. x s(context x order)	96	591864.28	6165.25		
	159	3633711.62			

*$p < .05$

Table A6-5
Simple Effects of Context
Average Response Times Based on Refrigerator Price

Source	_df_	_SS_	_MS_	_F_	_p_
Position 1					
Context	1	138709.51	138709.51	9.01*	.0052
Subjects(context x att.)	32	492889.10	15402.78		
Position 2					
Context	1	20793.60	20793.60	.97	.3323
Subjects(context x att.)	32	686628.90	21457.15		
Position 3					
Context	1	22254.81	22254.81	3.71	.0630
Subjects(context x att.)	32	191940.00	5998.13		
Position 4					
Context	1	132307.51	132307.51	3.46	.0720
Subjects(context x att.)	32	1223137.70	38223.05		

$^*p < .05$

Table A6-6
Analysis of Variance
Average Response Times Based on Carpet Cleaner Area Cleaned

Source	*df*	*SS*	*MS*	*F*	*p*
Between					
Context	4	780461.29	195115.32	4.90*	.0014
Order	3	36452.56	12150.85	.31	.8214
Context x order	12	521545.86	43462.16	1.09	.3781
Subjects(context x order)	80	3183380.98	39792.26		
Within					
Attractiveness	3	114574.63	38191.54	3.58*	.0145
Attractiveness x context	12	158286.66	13190.56	1.24	.2583
Position	3	719657.57	239885.85	22.49*	.0001
(Att. x order residual)	6	73719.12	12286.52	1.15	.3330
Position x context	12	117849.45	9820.79	.92	.5266
(Att. x context x ord. resid.)	24	291962.37	12165.10	1.14	.3391
Att. x s(context x order)	240	2559428.33	10664.28		
	399	8557318.81			

*$p < .05$

Table A6-7
Analysis of Variance
Average Response Times Based on Carpet Cleaner Price

Source	*df*	*SS*	*MS*	*F*	*p*
Between					
Context	1	114409.76	114409.76	3.52	.0697
Order	3	22503.73	7501.24	.23	.8742
Context x order	3	28072.50	9357.50	.29	.8337
Subjects(context x order)	32	1039486.50	32483.95		
Within					
Attractiveness	3	144602.90	48200.97	5.79*	.0011
Attractiveness x context	3	51032.13	17010.71	2.05	.1127
Position	3	213423.44	71141.15	8.55*	.0001
(Att. x order residual)	6	7437.24	1239.54	.15	.9889
Position x context	3	11244.27	3748.09	.45	.7175
(Att. x context x ord. resid.)	6	33138.40	5523.07	.66	.6788
Att. x s(context x order)	96	798520.60	8317.92		
	159	2463871.44			

*$p < .05$

Summary Tables for Planned Comparisons of Response Times

Table A6-8
Planned Comparisons for Response Times
Refrigerator Evaluations Based on Information about Capacity
Missing Attribute in Two-Attribute Context: Warranty

Source	*df*	*SS*	*MS*	*F*	*p*
Context	1	541260.23	541260.23	18.76*	.0001
Subjects(context x order)	32	923233.00	28851.03		
Number of attributes	1	30705.45	30705.45	3.93	.0620
Subjects x number of attributes	19	148319.89	7806.31		

*p < .05

Table A6-9
Planned Comparisons for Response Times
Refrigerator Evaluations Based on Information about Capacity
Missing Attribute in Two-Attribute Context: Shelf Space

Source	*df*	*SS*	*MS*	*F*	*p*
Context	1	218818.06	218818.06	15.48*	.0004
Subjects(context x order)	32	452306.58	14134.58		
Number of attributes	1	181205.25	181205.25	21.92*	.0002
Subjects x number of attributes	19	157034.90	8264.99		

*p < .05

Table A6-10
Planned Comparisons for Response Times
Refrigerator Evaluations Based on Information about Capacity
Missing Attribute in Two-Attribute Context: Energy Cost

Source	*df*	*SS*	*MS*	*F*	*p*
Context	1	420916.51	420916.51	31.32*	.0001
Subjects(context x order)	32	430050.20	13439.07		
Number of attributes	1	262399.50	262399.50	45.52*	.0001
Subjects x number of attributes	19	109535.28	5765.01		

$^{*}p < .05$

Table A6-11
Planned Comparisons for Response Times
Refrigerator Evaluations Based on Information about Capacity
Missing Attribute in Two-Attribute Context: Price

Source	*df*	*SS*	*MS*	*F*	*p*
Context	1	683103.56	683103.56	41.26*	.0001
Subjects(context x order)	32	529805.13	16556.41		
Number of attributes	1	16758.79	16758.79	1.04	.3198
Subjects x number of attributes	19	305104.55	16058.34		

$^{*}p < .05$

Table A6-12
Planned Comparisons for Response Times
Refrigerator Evaluations Based on Information about Price
Missing Attribute in Two-Attribute Context: Capacity

Source	_df_	_SS_	_MS_	_F_	_p_
Context	1	264997.70	264997.70	4.23*	.0478
Subjects(context x order)	32	2002731.43	62585.34		
Number of attributes	1	371718.40	371718.40	18.25*	.0004
Subjects x number of attributes	19	387011.10	20369.01		

$^*p < .05$

Table A6-13
Planned Comparisons for Response Times
Carpet Cleaner Evaluations Based on Information about Area Cleaned
Missing Attribute in Two-Attribute Context: Versatility

Source	_df_	_SS_	_MS_	_F_	_p_
Context	1	312670.81	312670.81	10.33*	.0030
Subjects(context x order)	32	968442.08	30263.82		
Number of attributes	1	17850.63	17850.63	1.71	.2063
Subjects x number of attributes	19	198122.75	10427.51		

$^*p < .05$

Table A6-14
Planned Comparisons for Response Times
Carpet Cleaner Evaluations Based on Information about Area Cleaned
Missing Attribute in Two-Attribute Context: Tank Capacity

Source	*df*	*SS*	*MS*	*F*	*p*
Context	1	336309.75	336309.75	8.33*	.0069
Subjects(context x order)	32	1292590.10	40393.44		
Number of attributes	1	99650.31	99650.31	4.97*	.0381
Subjects x number of attributes	19	381190.57	20062.66		

*$p < .05$

Table A6-15
Planned Comparisons for Response Times
Carpet Cleaner Evaluations Based on Information about Area Cleaned
Missing Attribute in Two-Attribute Context: Weight

Source	*df*	*SS*	*MS*	*F*	*p*
Context	1	264184.39	264184.39	9.51*	.0042
Subjects(context x order)	32	888782.18	27774.44		
Number of attributes	1	28063.51	28063.51	2.34	.1428
Subjects x number of attributes	19	228119.81	12006.31		

*$p < .05$

Table A6-16
Planned Comparisons for Response Times
Carpet Cleaner Evaluations Based on Information about Area Cleaned
Missing Attribute in Two-Attribute Context: Price

Source	*df*	*SS*	*MS*	*F*	*p*
Context	1	740996.45	740996.45	21.61*	.0001
Subjects(context x order)	32	1097322.98	34291.34		
Number of attributes	1	39705.75	39705.75	2.87	.1064
Subjects x number of attributes	19	262579.09	13819.95		

*$p < .05$

Table A6-17
Planned Comparisons for Response Times
Carpet Cleaner Evaluations Based on Information about Price
Missing Attribute in Two-Attribute Context: Area Cleaned

Source	*df*	*SS*	*MS*	*F*	*p*
Context	1	114409.76	114409.76	3.52	.0697
Subjects(context x order)	32	1039486.50	32483.95		
Number of attributes	1	611016.60	611016.60	42.22*	.0001
Subjects x number of attributes	19	274961.05	14471.63		

*$p < .05$

Order and Position Effects in Product Evaluations

The attractiveness of the known attribute, which was varied across four levels within subjects, was counterbalanced so that each attractiveness level appeared equally often in each ordinal position. This allows an assessment of order and position effects. Order and position effects are of interest primarily when they may alter the interpretation of substantive effects. In the current study, hypotheses about the evaluation process concern the main effect of context and the context x attractiveness of the known attribute interaction. Therefore, only order and position effects which alter the interpretation of the context main effect and the context x attractiveness interaction are of serious concern. As will be seen below, no order or position effects which would alter the interpretation of these planned comparisons were found.

An analysis of variance with context (one-attribute context and two-attribute contexts) and order (four counterbalancing sequences) as between subjects factors and attractiveness of the known attribute (very unattractive, moderately unattractive, moderately attractive, and very attractive), replications (first and second rating), and ordinal position (one, two, three, or four) as within subjects factors was conducted for each known attribute.

The order main effect indicates whether there is a difference, on the average, in way that products are evaluated in different counterbalancing sequences. If this effect is significant, it implies that there is some differential transfer in the evaluation of different attractiveness levels. As the attractiveness main effect is not of substantive interest, however, a significant effect of order is not of serious concern.

The context x order interaction indicates whether the average effects of couterbalancing sequence are different in different information contexts. If this effect is significant, it implies that there is a difference in the type or amount of differential transfer in different information contexts. If this occurs, the main effect of context may be at least partially attributable to these differences in differential transfer. Therefore, for there to be no concern about the interpretation of the context main effect, the context x order interaction should be nonsignificant.

The position main effect indicates whether, on the average, evaluations vary as a function of ordinal position. If the position main effect is significant, it implies that evaluations are affected not only by the attractiveness of the description, but also by ordinal position. As the main effect of attractiveness is of little substantive interest, however, a main effect of position is of little concern.

The position x context interaction indicates whether the average effects of ordinal position are different in different information contexts. If this effect is significant, it implies that both the main effect of context and the context x attractiveness of the known attribute interaction may be partially attributable to differences in position effects between contexts. Therefore, for the interpretation of the context main effect and the context x attractiveness interaction to be unambiguous, the position x context interaction should be nonsignificant.

As was true for the response latency dependent variable, however, it is possible for the position x context interaction to be significant without altering the interpretation of the planned comparisons. Although subjects may, for example, evaluate the first test description in the two-attribute context differently from the others, this is not a problem as long as the simple effects of context are consistent in all ordinal positions.

The position x replication interaction indicates whether the average effects of position are different for the first and second replications. As the effect of replications is not of substantive interest, a position x replication interaction is of little concern.

The position x context x replication interaction indicates whether the position x context interaction is the same for each replication. While this effect is of little interest in itself, the possibility that this three-way interaction obscures a position x context interaction makes it desirable that this effect be nonsignificant. If it is significant, then the simple effects of position x context must be examined. For the interpretation of the context main effect and the context x attractiveness interactions to be unambiguous, these simple effects should be nonsignificant.

In summary, the context main effect, the position main effect, and the position x replication interaction are of little interest. In order for context main effect and the context x attractiveness of the known attribute interaction to be unambiguously interpreted, the context x order interaction, the position x context interaction, and the position x context x replication interactions should be nonsignificant. If the position x context x replication interaction is significant, this is not a serious problem as long as the simple position x context interactions are nonsignificant. If the position x context interaction is significant, this is not a problem as long as the simple effects of context are consistent in different ordinal positions.

The analyses of variance are summarized in Tables A6-18 through A6-22. With one exception, the effects of interest were not significant. For evaluations based on refrigerator capacity, however, there was a significant position x context x replication interaction. The simple position x context interactions are summarized in Table A6-19. Both simple interactions were nonsignificant, indicating no no differences in position effects across contexts.

As these analyses uncovered no position or order effects which alter the interpretation of the planned comparisons, the planned comparisons may be interpreted unambiguously.

Table A6-18
Analysis of Variance
Refrigerator Evaluations Based on Capacity

Source	*df*	*SS*	*MS*	*F*	*p*
Between					
Context	4	134.99	33.75	6.18*	.0002
Order	3	11.73	3.91	.72	.5454
Context x order	12	107.99	9.00	1.65	.0949
Subjects(context x order)	80	436.80	5.46		
Within					
Attractiveness	3	1502.31	500.77	144.18*	.0001
Attractiveness x context	12	87.86	7.32	2.11*	.0171
Position	3	24.38	8.13	2.34	.0741
(Att. x order residual)	6	38.71	6.45	1.87	.0870
Position x context	12	21.14	1.76	.51	.9092
(Att. x context x ord. residual)	24	37.27	1.55	.45	.9892
Att. x subjects(context x order)	240	833.60	3.47		
Replication	1	.02	.02	.04	.8465
Replication x context	4	1.62	.40	.76	.5525
Replication x order	3	1.41	.47	.89	.4517
Replication x context x order	12	2.30	.19	.36	.9729
Rep. x subjects(context x order)	80	42.40	.53		
Att. x replication	3	.19	.06	.17	.9197
Att. x replication x context	12	1.77	.15	.39	.9680
Position x replication	3	4.42	1.47	3.84*	.0103
(Att. x ord. x rep. residual)	6	.88	.15	.38	.8895
Position x replication x context	12	3.59	.30	.78	.6699
(Att. x ord. x con. x rep. resid.)	24	7.40	.31	.81	.7292
Att. x rep. x s(context x order)	240	92.00	.38		
	799	3394.76			

*p < .05

Table A6-19
Simple Position x Context Interactions
Refrigerator Evaluations Based on Capacity

Source	*df*	*SS*	*MS*	*F*	*p*
Replication 1					
Position x context	12	12.78	1.06	.56	.8699
Att. x subjects(context x order)	240	453.20	1.89		
Replication 2					
Position x context	12	11.96	1.00	.51	.9098
Att. x subjects(context x order)	240	472.40	1.97		

Table A6-20
Analysis of Variance
Refrigerator Evaluations Based on Price

Source	*df*	*SS*	*MS*	*F*	*p*
Between					
Context	1	9.80	9.80	1.43	.2399
Order	3	38.73	12.91	1.89	.1513
Context x order	3	14.28	4.76	.70	.5611
Subjects(context x order)	32	218.65	6.83		
Within					
Attractiveness	3	788.78	262.93	81.70*	.0001
Attractiveness x context	3	22.48	7.49	2.33	.0794
Position	3	14.00	4.67	1.45	.2331
(Att. x order residual)	6	18.25	3.04	.95	.4668
Position x context	3	6.55	2.18	.68	.5674
(Att. x context x ord. residual)	6	12.50	2.08	.65	.6924
Att. x subjects(context x order)	96	308.95	3.22		
Replication	1	1.01	1.01	1.90	.1776
Replication x context	1	1.01	1.01	1.90	.1776
Replication x order	3	.56	.19	.35	.7880
Replication x context x order	3	.86	.29	.54	.6586
Rep. x subjects(context x order)	32	17.05	.53		
Att. x replication	3	.66	.22	.70	.5524
Att. x replication x context	3	1.11	.37	1.18	.3212
Position x replication	3	2.44	.82	2.59	.0575
(Att. x ord. x rep. residual)	6	4.93	.82	2.62*	.0216
Position x replication x context	3	3.44	1.15	3.65*	.0153
(Att. x ord. x con. x rep. resid.)	6	1.78	.30	.94	.4681
Att. x rep. x s(context x order)	96	30.15	.31		
	319	1517.95			

*p < .05

Table A6-21
Analysis of Variance
Carpet Cleaner Evaluations Based on Area Cleaned

Source	df	SS	MS	F	p
Between					
Context	4	26.25	6.56	1.71	.1549
Order	3	61.53	20.51	5.36*	.0022
Context x order	12	47.93	3.99	1.04	.4185
Subjects(context x order)	80	306.15	3.83		
Within					
Attractiveness	3	2048.85	682.95	260.98*	.0001
Attractiveness x context	12	88.46	7.37	2.82*	.0013
Position	3	5.25	1.75	.67	.5724
(Att. x order residual)	6	35.58	5.93	2.27*	.0380
Position x context	12	51.86	4.32	1.65	.0786
(Att. x context x ord. residual)	24	25.72	1.07	.41	.9942
Att. x subjects(context x order)	240	628.05	2.62		
Replication	1	.61	.61	.72	.3984
Replication x context	4	1.37	.34	.41	.8023
Replication x order	3	1.65	.55	.65	.5832
Replication x context x order	12	6.48	.54	.64	.7990
Rep. x subjects(context x order)	80	67.15	.84		
Att. x replication	3	5.61	1.87	2.95*	.0336
Att. x replication x context	12	12.57	1.05	1.65	.0786
Position x replication	3	3.17	1.06	1.66	.1756
(Att. x ord. x rep. residual)	6	9.30	1.55	2.45*	.0259
Position x replication x context	12	7.31	.61	.96	.4877
(Att. x ord. x con. x rep. resid.)	24	20.55	.86	1.35	.1331
Att. x rep. x s(context x order)	240	152.25	.63		
	799	3613.60			

*p < .05

Table A6-22
Analysis of Variance
Carpet Cleaner Evaluations Based on Price

Source	*df*	*SS*	*MS*	*F*	*p*
Between					
Context	1	42.78	42.78	5.47*	.0258
Order	3	30.33	10.11	1.29	.2939
Context x order	3	16.36	5.45	.70	.5608
Subjects(context x order)	32	250.40	7.83		
Within					
Attractiveness	3	320.18	106.73	24.75*	.0001
Attractiveness x context	3	75.86	25.29	5.86*	.0010
Position	3	15.31	5.10	1.18	.3202
(Att. x order residual)	6	11.37	1.90	.44	.8504
Position x context	3	12.23	4.08	.95	.4218
(Att. x context x ord. residual)	6	32.42	5.40	1.25	.2865
Att. x subjects(context x order)	96	414.00	4.31		
Replication	1	.03	.03	.09	.7684
Replication x context	1	.25	.25	.79	.3795
Replication x order	3	.61	.20	.64	.5965
Replication x context x order	3	1.03	.34	1.08	.3708
Rep. x subjects(context x order)	32	10.20	.32		
Att. x replication	3	2.76	.92	2.15	.0985
Att. x replication x context	3	.93	.31	.73	.5370
Position x replication	3	1.13	.38	.89	.4516
(Att. x ord. x rep. residual)	6	1.52	.25	.59	.6263
Position x replication x context	3	.86	.29	.67	.5721
(Att. x ord. x con. x rep. resid.)	6	4.17	.70	1.63	.1377
Att. x rep. x s(context x order)	96	41.00	.43		
	319	1285.75			

*$p < .05$

Summary Tables for Planned Comparisons of Product Evaluations

Table A6-23
Planned Comparisons
Refrigerator Evaluations Based on Capacity
(Two-Attribute Context: Capacity and Warranty)

Source	*df*	*SS*	*MS*	*F*	*p*
Context	1	93.53	93.53	17.35*	.0002
Subjects(context x order)	32	172.50	5.39		
Linear x context	1	39.06	39.06	11.60*	.0018
Linear x subjects(context x order)	32	107.73	3.37		

*$p < .05$

Table A6-24
Planned Comparisons
Evaluations Based on Capacity
(Two-Attribute Context: Capacity and Shelf Space)

Source	*df*	*SS*	*MS*	*F*	*p*
Context	1	53.63	53.63	14.11*	.0007
Subjects(context x order)	32	121.60	3.80		
Linear x context	1	10.85	10.85	1.73	.1974
Linear x subjects(context x order)	32	200.30	6.26		

*$p < .05$

Table A6-25
Planned Comparisons
Refrigerator Evaluations Based on Capacity
(Two-Attribute Context: Capacity and Energy Cost)

Source	*df*	*SS*	*MS*	*F*	*p*
Context	1	1.25	1.25	.27	.6044
Subjects(context x order)	32	146.10	4.57		
Linear x context	1	47.68	47.68	12.79*	.0011
Linear x subjects(context x order)	32	119.30	3.73		

$^*p < .05$

Table A6-26
Planned Comparisons
Refrigerator Evaluations Based on Capacity
(Two-Attribute Context: Capacity and Price)

Source	*df*	*SS*	*MS*	*F*	*p*
Context	1	11.25	11.25	2.77	.1058
Subjects(context x order)	32	129.95	4.06		
Linear x context	1	51.10	51.10	5.60*	.0242
Linear x subjects(context x order)	32	292.08	9.13		

$^*p < .05$

Table A6-27
Planned Comparisons
Refrigerator Evaluations Based on Price
(Two-Attribute Context: Capacity and Price)

Source	df	SS	MS	F	p
Context	1	9.80	9.80	1.43	.2399
Subjects(context x order)	32	218.65	6.83		
Linear x context	1	22.07	22.07	3.03	.0916
Linear x subjects(context x order)	32	233.40	7.29		

Table A6-28
Planned Comparisons
Carpet Cleaner Evaluations Based on Area Cleaned
(Two-Attribute Context: Area Cleaned and Versatility)

Source	df	SS	MS	F	p
Context	1	6.33	6.33	1.84	.1840
Subjects(context x order)	32	109.85	3.43		
Linear x context	1	21.50	21.50	4.96*	.0332
Linear x subjects(context x order)	32	138.82	4.34		

*$p < .05$

Table A6-29
Planned Comparisons
Carpet Cleaner Evaluations Based on Area Cleaned
(Two-Attribute Context: Area Cleaned and Tank Capacity)

Source	*df*	*SS*	*MS*	*F*	*p*
Context	1	0.00	0.00	0.00	.9755
Subjects(context x order)	32	104.15	3.25		
Linear x context	1	.05	.05	.02	.8883
Linear x subjects(context x order)	32	79.65	2.49		

Table A6-30
Planned Comparisons
Carpet Cleaner Evaluations Based on Area Cleaned
(Two-Attribute Context: Area Cleaned and Weight)

Source	*df*	*SS*	*MS*	*F*	*p*
Context	1	.38	.38	.13	.7164
Subjects(context x order)	32	90.05	2.81		
Linear x context	1	6.20	6.20	1.28	.2658
Linear x subjects(context x order)	32	154.55	4.83		

Table A6-31
Planned Comparisons
Carpet Cleaner Evaluations Based on Area Cleaned
(Two-Attribute Context: Area Cleaned and Price)

Source	df	SS	MS	F	p
Context	1	16.65	16.65	4.26*	.0472
Subjects(context x order)	32	125.10	3.91		
Linear x context	1	48.52	48.52	10.97*	.0023
Linear x subjects(context x order)	32	141.56	4.42		

*p < .05

Table A6-32
Planned Comparisons
Carpet Cleaner Evaluations Based on Price
(Two-Attribute Context: Area Cleaned and Price)

Source	df	SS	MS	F	p
Context	1	42.78	42.78	5.47*	.0258
Subjects(context x order)	32	250.40	7.83		
Linear x context	1	72.92	72.92	6.91*	.0131
Linear x subjects(context x order)	32	337.93	10.56		

*p < .05

REFERENCES

Abelson, Robert P., Elliot Aronson, William J. McGuire, Theodore M. Newcomb, Milton J. Rosenberg, and Percy H. Tannenbaum, eds. (1968), Theories of Cognitive Consistency: A Sourcebook, Chicago: Rand McNally.

Ahtola, Olli T. (1978), "An Empirical Investigation of the Evaluative Aspect of Certainty/Uncertainty," Unpublished working paper, Center for Consumer Research, University of Florida, Gainesville.

Alba, Joseph W. and Amitava Chattopadhyay (1985), "The Effects of Part-List Cuing on Attribute Recall: Problem Framing at the Point of Retrieval," in Advances in Consumer Research, Vol. 12, eds. Elizabeth C. Hirschman and Morris L. Holbrook, Provo, UT: Association for Consumer Research, 410-413.

Anderson, Norman H. (1965), "Adding Versus Averaging as a Stimulus Combination Rule in Impression Formation," Journal of Experimental Psychology, 70 (October), 394-400.

---------- (1967), "Averaging Model Analysis of Set Size Effect in Impression Formation," Journal of Experimental Psychology, 75 (October), 158-165.

---------- (1968), "Application of a Linear Serial Model to a Personality-Impression Task Using Serial Presentation," Journal of Personality and Social Psychology, 10 (December), 354-362.

---------- (1971), "Integration Theory and Attitude Change," Psychological Review, 78 (March), 171-206.

---------- (1974), "Information Integration Theory: A Brief Survey," in David H. Krantz, Richard C. Atkinson, R. Duncan Luce, and Patrick Suppes, eds., Contemporary Developments in Mathematical Psychology, New York: Academic Press, 236-305.

---------- (1981), Foundations of Information Integration Theory, New York: Academic Press.

---------- (1982), Methods of Information Integration Theory, New York: Academic Press.

---------- and James Shanteau (1977), "Weak Inference with Linear Models," Psychological Bulletin, 84 (November), 1155-1170.

Anderson, Timothy and Michael H. Birnbaum (1976), "Test of an Additive Model of Social Inference," Journal of Personality and Social Psychology, 33 (June), 665-662.

Baddeley, Alan D. and Graham Hitch (1974), "Working Memory," in Gordon Bower, ed., The Psychology of Learning and Motivation, Vol. 8, New York: Academic Press, 47-89.

Bauer, Raymond A. (1960), "Consumer Behavior as Risk Taking," in Robert S. Hancock, ed., Dynamic Marketing for a Changing World, Chicago: American Marketing Association, 389-398.

Bem, Daryl J. (1972), "Self Perception Theory," in Leonard Berkowitz, ed., Advances in Experimental Social Psychology, Vol. 6, New York: Academic Press.

Bettman, James R. and C. Whan Park (1980), "Effects of Prior Knowledge and Experience and Phase of the Choice Process on Consumer Decision Processes. A Protocol Analysis," Journal of Consumer Research, 7 (December), 234-248.

---------- and Pradeep Kakkar (1977), "Effects of Information Presentation Format on Consumer Information Acquisition Strategies," Journal of Consumer Research, 3 (March), 233-240.

Biehal, Gabriel and Dipankar Chakravarti (1983), "Information Accessibility as a Moderator of Consumer Choice," Journal of Consumer Research, 10 (June), 1-14.

---------- and Dipankar Chakravarti (1986), "Consumers' Use of Memory and External Information in Choice: Macro and Micro Perspectives," Journal of Consumer Research, 12 (March), 382-405.

Birnbaum, Michael H. (1973), "Test of an Averaging Model with Differential Weight," Journal of Experimental Psychology, 99 (April), 395-399.

---------- (1974), "The Nonadditivity of Personality Impressions," Journal of Experimental Psychology, 102 (March), 543-561.

---------- (1982), "Controversies in Psychological Measurement," in B. Wegener, ed., Social Attitudes and Psychological Measurement, Hillsdale, N.J.: Lawrence Erlbaum Associates, 401-485.

---------- and Steven E. Stegner (1976), "Source Credibility in Social Judgment: Bias, Expertise, and the Judge's Point of View," Journal of Personality and Social Psychology, 37 (July), 48-74.

---------- and Steven E. Stegner (1981), "Measuring the Importance of Cues in Judgment for Individuals: Subjective Theories of IQ, Heredity, and Environment," Journal of Experimental Social Psychology, 17 (March), 159-182.

Britton, Bruce K., Robert D. Westbrook, and Timothy S. Holdredge (1978), "Reading and Cognitive Capacity Usage: Effects of Text Difficulty," *Journal of Experimental Psychology: Human Learning and Memory*, 4 (June), 582-591.

Cohen, Joel B. (1977), "The Structure of Product Attributes: Defining Attribute Dimensions for Planning and Evaluation," Unpublished working paper, Center for Consumer Research, University of Florida, Gainesville.

----------, Paul W. Miniard, and Peter R. Dickson (1980), "Information Integration: An Information Processing Perspective," in *Advances in Consumer Research*, Vol. 7, ed. Jerry Olson, Ann Arbor, MI: Association for Consumer Research, 161-169.

Cook, Thomas D. and Donald T. Campbell (1979), *Quasi-Experimentation: Design and Analysis Issues for Field Settings*, Boston: Houghton Mifflin Company, 1979.

Cox, Donald F. (1967), *Risk-Taking and Information-Handling in Consumer Behavior*, Boston: Harvard University Press.

Dick, Alan (1985), *Memory Influences on Inferential Processes During Consumer Choice*, Unpublished master's thesis, University of Florida, Gainesville.

Dover, Philip A. (1982), "Inferential Belief Formation: An Overlooked Concept in Information Processing Research," in *Advances in Consumer Research*, Vol. 9, ed. Andrew Mitchell, Ann Arbor, MI: Association for Consumer Research, 187-189.

Einhorn, Hillel J. (1970), "Use of Nonlinear, Noncompensatory Models in Decision Making," *Psychological Bulletin*, 73 (March), 221-230.

---------- (1971), "Use of Nonlinear, Noncompensatory Models as a Function of Task and Amount of Information," *Organizational Behavior and Human Performance*, 6 (January), 1-27.

---------- and Robin M. Hogarth (1981), "Behavioral Decision Theory: Processes of Judgment and Choice," *Annual Review of Psychology*, 32, 53-88.

Ericsson, K. Anders and Herbert A. Simon (1980), "Verbal Reports as Data," *Psychological Review*, 87 (May), 215-251.

Festinger, Leon (1957), *A Theory of Cognitive Dissonance*, Stanford: Stanford University Press.

Fishbein, Martin (1967), "Attitudes and the Prediction of Behavior," in Martin Fishbein, ed., *Readings in Attitude Theory and Measurement*, New York: John Wiley & Sons, 477-492.

---------- and Icek Ajzen (1975), Belief, Attitude, Intention, and Behavior: An Introduction to Theory and Research, Reading, Mass.: Addison-Wesley.

Graesser, Arthur C., Scott P. Robertson, and Patricia A. Anderson (1981), "Incorporating Inferences in Narrative Representations: A Study of How and Why," Cognitive Psychology, 13 (January), 1-26.

Green, Paul E. and V. Srinivasan (1978), "Conjoint Analysis in Consumer Research: Issues and Outlook," Journal of Consumer Research, 5 (September), 103-123.

Hansen, Chris J. and George M. Zinkham (1984), "When Do Consumers Infer Product Attribute Values?" in Advances in Consumer Research, Vol. 11, ed. Thomas C. Kinnear, Provo, UT: Association for Consumer Research, 187-192.

Heider, Fritz (1944), "Social Perception and Phenomenal Causality," Psychological Review, 51 (November), 358-374.

---------- (1946), "Attitudes and Cognitive Organization," Journal of Psychology, 21, 107-112.

---------- (1958), The Psychology of Interpersonal Relations, New York: Wiley.

Huber, Joel and John McCann (1982), "The Impact of Inferential Beliefs on Product Evaluations," Journal of Marketing Research, 14 (August), 324-333.

Hunt, Earl (1978), "Mechanics of Verbal Ability," Psychological Review, 85 (March), 109-130.

Jacoby, Jacob, Donald E. Speller, and Carol A. Kohn-Berning (1974), "Brand Choice as a Function of Information Load," Journal of Marketing Research, 11 (February), 63-69.

----------, George J. Szybillo, and Jacqueline Busato-Schach (1977), "Information Acquisition Behavior in Brand Choice Situations," Journal of Consumer Research, 3 (March), 209-216.

Johnston, William A., Rollie R Wagstaff, and Douglas Griffith (1972), "Information-Processing Analysis of Verbal Learning," Journal of Experimental Psychology, 96 (December), 307-314.

Jones, Edward E. and Keith E. Davis (1965), "From Acts to Dispositions: The Attribution Process in Person Perception," in Leonard Berkowitz, ed., Advances in Experimental Social Psychology, Vol. 2, New York: Academic Press, 219-266.

Kahneman, Daniel (1973), Attention and Effort, Englewood Cliffs, N. J.: Prentice-Hall.

Kaplan, Martin F. (1971), "Disposition Effects and Weight of Information in Impression Formation," Journal of Personality and Social Psychology, 18 (June), 279-284.

Kelley, Harold H. (1967), "Attribution Theory in Social Psychology," in David Levine, ed., Nebraska Symposium on Motivation, Vol. 15, Lincoln: University of Nebraska Press, 192-240.

---------- (1972), Causal Schemata and the Attribution Process, Morristown, N. J.: General Learning Press.

Kerr, Beth (1973), "Processing Demands During Mental Operations," Memory and Cognition, 1 (October), 401-412.

Krantz, David H. and Amos Tversky (1971), "Conjoint Measurement Analysis of Composition Rules in Psychology," Psychological Review, 78 (March), 151-169.

Lussier, Denis A. and Richard W. Olshavsky (1979), "Task Complexity and Contingent Processing in Brand Choice," Journal of Consumer Research, 6 (September), 154-165.

Lynch, John G., Jr. (1979), "Why Additive Utility Models Fail as Descriptions of Choice Behavior," Journal of Experimental Social Psychology, 15 (July), 397-417.

---------- (1985), "Uniqueness Issues in the Decompositional Modeling of Multiattribute Overall Evaluations: An Information Integration Perspective," Journal of Marketing Research, 22 (February), 1-19.

---------- and Jerry L. Cohen (1978), "The Use of Subjective Expected Utility Theory as an Aid to Understanding Variables that Influence Helping Behavior," Journal of Personality and Social Psychology, 36 (October), 1138-1151.

---------- and Thomas K. Srull (1982), "Memory and Attentional Factors in Consumer Choice: Concepts and Research Methods," Journal of Consumer Research, 9 (June), 18-37.

MacNemar, Quinn (1969), Psychological Statistics, New York: Wiley.

Martin, David W. (1970), "Residual Processing Capacity During Verbal Organization in Memory," Journal of Verbal Learning and Verbal Behavior, 9 (August), 391-397.

Mazis, Michael R. and Janice E. Atkinson (1976), "An Experimental Evaluation of a Proposed Corrective Advertising Remedy," Journal of Marketing Research, 13 (March), 178-183.

McGuire, William J. (1968), "The Nature of Attitudes and Attitude Change," in Gardner Lindzey and Elliot Aronson, eds., Handbook of Social Psychology, Reading, Mass.: Addison-Wesley, 136-314.

Meyer, Robert J. (1981), "A Model of Multiattribute Judgments under Attribute Uncertainty and Informational Constraint," Journal of Marketing Research, 18 (November), 428-441.

Monroe, Kent B. (1973), "Buyers' Subjective Perceptions of Price," Journal of Marketing Research, 10 (February), 70-80.

Moore, Danny L. (1984), "The Behavioral Measurement of Information Load," Unpublished working paper, Center for Consumer Research, University of Florida, Gainesville.

Murdock, Bennet B., Jr. (1965), "Effects of a Subsidiary Task on Short-term Memory," British Journal of Psychology, 56 (November), 413-419.

Nisbett, Richard E. and Timothy D. Wilson (1977), "Telling More Than We Can Know: Verbal Reports on Mental Processes," Psychological Review, 84 (May), 231-259.

Olson, Jerry C. (1978), "Inferential Belief Formation in the Cue Utilization Process," in Advances in Consumer Research, Vol. 5, ed. H Keith Hunt, Ann Arbor, MI: Association for Consumer Research, 706-713.

---------- and Philip A. Dover (1978a), "Cognitive Effects of Deceptive Advertising," Journal of Marketing Research, 15 (February), 29-38.

---------- and Philip A. Dover (1978b), "Attitude Maturation: Changes in Related Belief Structures Over Time," in Advances in Consumer Research, Vol. 5, ed. H. Keith Hunt, Ann Arbor, MI: Association for Consumer Research, 72-78.

Osgood, Charles E. and Percy H. Tannenbaum (1955), "The Principle of Congruity in the Prediction of Attitude Change," Psychological Review, 62 (January), 42-55.

Parducci, Allen (1965), "Category Judgment: A Range-Frequency Model," Psychological Review, 72 (November), 407-418.

Posner, Michael I. and Stephen J. Boies (1971), "Components of Attention," Psychological Review, 78 (September), 391-408.

---------- and Raymond M. Klein (1973), "On Functions of Consciousness," in Sylvan Kornblum, ed., Attention and Performance, New York: Academic Press, 21-35.

Roediger, Henry L. (1974), "Inhibiting Effects of Recall," Memory and Cognition, 2 (April), 261-269.

Rosenthal, Robert (1982), "Valid Interpretation of Quantitative Research Results," in David Brinberg and L. Kidder, eds., New Directions for Methodology of Social and Behavioral Science: Forms of Validity in Research, no. 12, San Francisco: Jossey-Bass, 59-75.

Rundus, Dewey (1973), "Negative Effects of Using List Items as Recall Cues," Journal of Verbal Learning and Verbal Behavior, 12 (February), 43-50.

Scammon, Debra L. (1977), "Information Load and Consumers," Journal of Consumer Research, 4 (December), 148-155.

Slovic, Paul (1972), "From Shakespeare to Simon: Speculations--and Some Evidence--About Man's Ability to Process Information," Oregon Research Institute Research Monograph, 12(12).

---------- and Douglas MacPhillamy (1974), "Dimensional Commensurability and Cue Utilization in Comparative Judgment," Organizational Behavior and Human Performance, 11 (April), 172-194.

Tversky, Amos (1967), "Additivity, Utility, and Subjective Probability," Journal of Mathematical Psychology, 4 (June), 175-201.

---------- (1969), "Intransitivity of Preferences," Psychological Review, 76 (January), 31-48.

---------- (1977), "Features of Similarity," Psychological Review, 84 (July), 327-352.

Tyler, Serman W., Paula T. Hertel, Marvin C. McCallum, and Henry C. Ellis (1979), "Cognitive Effort and Memory," Journal of Experimental Psychology: Human Learning and Memory, 5 (November), 607-617.

Wald, A. (1943) "Tests of Statictical Hypotheses Concerning General Parameters When the Number of Observations is Large," Transactions of the American Mathematical Society, 54, 426-482.

Wilkie, William L. (1974), "Analysis of Effects of Information Load," Journal of Marketing Research, 11 (November), 462-466.

---------- and Edgar A. Pessemier (1973), "Issues in Marketing's Use of Multi-Attribute Attitude Models," Journal of Marketing Research, 10 (November), 428-441.

Wright, Peter (1974), "The Harrassed Decision Maker: Time Pressures, Distractions, and the Use of Evidence," Journal of Applied Psychology, 59 (October), 555-561.

---------- (1975), "Consumer Choice Strategies: Simplifying Versus Optimizing," Journal of Marketing Research, 12 (February), 60-67.

---------- (1980), "Message-Evoked Thoughts: Persuasion Research Using Thought Verbalizations," Journal of Consumer Research, 7 (September), 151-175.

---------- and Peter D. Rip (1980), "Product Class Advertising Effects on First-time Buyers' Decision Strategies," Journal of Consumer Research, 7 (September), 176-188.

Wyer, Robert and Donald Carlston (1979), Social Cognition, Inference, and Attribution, Hillsdale, NJ: Erlbaum.

Yamagishi, Toshio and Charles T. Hill (1981), "Adding Versus Averaging Models Revisited: A Test of a Path-Analytic Integration Model," Journal of Personality and Social Psychology, 41 (July), 13-25.

---------- and Charles T. Hill (1983), "Initial Impression Versus Missing Information as Explanations of the Set-Size Effect," Journal of Personality and Social Psychology, 44 (May), 942-951.

Yates, J. Frank, Carolyn M. Jagacinki, and Mark D. Faber (1978), "Evaluation of Partially Described Multi-Attribute Options," Organizational Behavior and Human Performance, 21 (April), 240-251.

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I certify that I have read this study and that in my opinion it conforms to acceptable standards of scholarly presentation and is fully adequate, in scope and quality, as a dissertation for the degree of Doctor of Philosophy.

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